Draft Environmental Assessment for a Cavalry Unit Transfer to the Montana Army National Guard

Fort William Henry Harrison and Limestone Hills, Montana

November 1998

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DRAFT ENVIRONMENTAL ASSESSMENT

CAVALRY UNIT TRANSFER

Prepared For

MONTANA ARMY NATIONAL GUARD

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LEAD AGENCY, ABSTRACT AND SIGNATURE PAGE

Lead Agency:	Department of the Army, U.S. Army National Guard Bureau
Cooperating Agencies:	None
Title of Proposed Action:	Transfer of Cavalry Unit Equipment to the Montana Army National Guard
Affected Jurisdiction:	Montana, USA
Point of Contact:	Mr. John Wheeler, Environmental Program Manager Environmental Office Fort Harrison; Helena, Montana
Proponents:	Army National Guard Bureau and the Montana Army National Guard

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Document Designation: Environmental Assessment

Abstract:

The Department of the Army, National Guard Bureau, proposes to upgrade the Montana Army National Guard (MT ARNG) inventory of light armored vehicles through the transfer of 28 armored tracked vehicles, 15 wheeled vehicles, and associated equipment that compose a Cavalry Unit from the Arizona Army National Guard at Fort Huachuca, Arizona. The vehicles in the Cavalry Unit would be fielded in training areas in Montana that are currently used for tracked vehicle training activities. The Proposed Action includes the transport, management and use of the Cavalry Unit vehicles and associated equipment to replace 17 M1 Abrams main battle tanks currently in use by the MT ARNG. No troops would be transferred. This transfer is necessary to maintain combat readiness in fulfillment of the National Guard Mission.

This Environmental Assessment (EA) evaluates the individual and cumulative effects of the Proposed Action and the No Action Alternative with respect to a variety of criteria established by the Army National Guard, including the geographic setting, land use, air quality, noise, geology and soils, biological resources, cultural resources, socioeconomic environment, infrastructure and hazardous and toxic materials and wastes.

The evaluation completed as the work product of this EA concludes that that will be no significant impact, either individually or cumulatively, to the local environment or quality of life as a result of the Proposed Action.

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SECTION 1.0: PURPOSE AND NEED FOR THE PROPOSED ACTION

This section identifies the Proposed Action, responsible agencies involved, and regulations governing the National Environmental Policy Act (NEPA) under which this document was prepared. In addition to the introduction in Section 1.1, Section 1.2 provides a justification for the Proposed Action and the decision required regarding this proposal. Section 1.3 presents an overview of the action and alternative, sites analyzed, and resources evaluated in the environmental assessment (EA).

Later sections present a description of the Proposed Action (Section 2.0), alternatives considered (Section 3.0), the affected environment (Section 4.0), and environmental consequences of the Proposed Action (Section 5.0). A comparison of alternatives and conclusions is presented in Section 6.0 and references are listed in Section 7.0. A list of preparers and agencies and individuals consulted is provided in Section 8.0. Data for development of maps included in this report were retrieved from several sources: Most of the information was obtained from the Montana Department of Military Affairs Geographic Information System database. Additional information was obtained from the Montana Natural Resource Information System (Montana State Library database), the U.S. Bureau of Mines database, and the U.S. Geological Survery database. References for all sources of information used on maps is provided in Appendix A.

1.1 INTRODUCTION

The Proposed Action is part of the Montana Army National Guard's (MT ARNG) program to maintain combat readiness for selected National Guard units by upgrading the light armored vehicles. The primary proposed federal action that prompts the need for this EA is the acquisition and use of 28 armored tracked vehicles, 15 wheeled vehicles, and associated equipment transferred as a Cavalry Unit from the Arizona Army National Guard at Fort Huachuca, Arizona. The vehicles in the Cavalry Unit would be fielded in areas currently used for tracked vehicle training activities. The Proposed Action includes the transport, management and fielding of the Cavalry Unit vehicles and associated equipment. No troops would be transferred.

The MT ARNG is the lead agency in preparing this EA for the proposed equipment transfer. This document follows regulations promulgated by the Council on Environmental Quality for implementing the procedural provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) and written in accordance with Department of the Army Regulation 200-2 and the Army National Guard NEPA Compliance Manual (Army National Guard 1998).

1.2 PURPOSE AND NEED

The Army National Guard makes up more than one half of the total Army's ground combat forces and one-third of its support forces. The guard's three missions are to:

- participate in global security for the United States,
- provide emergency response at the state level, and
- give support to local community needs.

National Guard units are organized, trained and equipped to the same standards as the U.S. Army and the U.S. Air Force. Because the MT ARNG is a part of the national force structure and as such, must be prepared to use military equipment effectively, training exercises with cavalry troop equipment are an important element of the MT ANRG mission to maintain combat readiness.

The purpose of the equipment transfer would be to provide additional combat-readiness training opportunities to MT ARNG personnel, specifically in the use of M1A1 tanks and Cavalry Fighting Vehicles (CFVs). The upgraded M1 tank system was developed in response to a national need identified by the Department of the Army to maintain combat readiness. The basic priorities and functions in the design of the M1 tank were to increase survivability, firepower, and mobility over that provided by the older M60 tank series. The proposed transfer of vehicles and associated equipment is the result of the loss of adequate training facilities at Fort Huachuca and the need for upgraded equipment for training and military readiness for MT ARNG personnel. The Proposed Action would enable the MT ARNG to fulfill its federal mission requirements as a fully mechanized armored ground support unit.

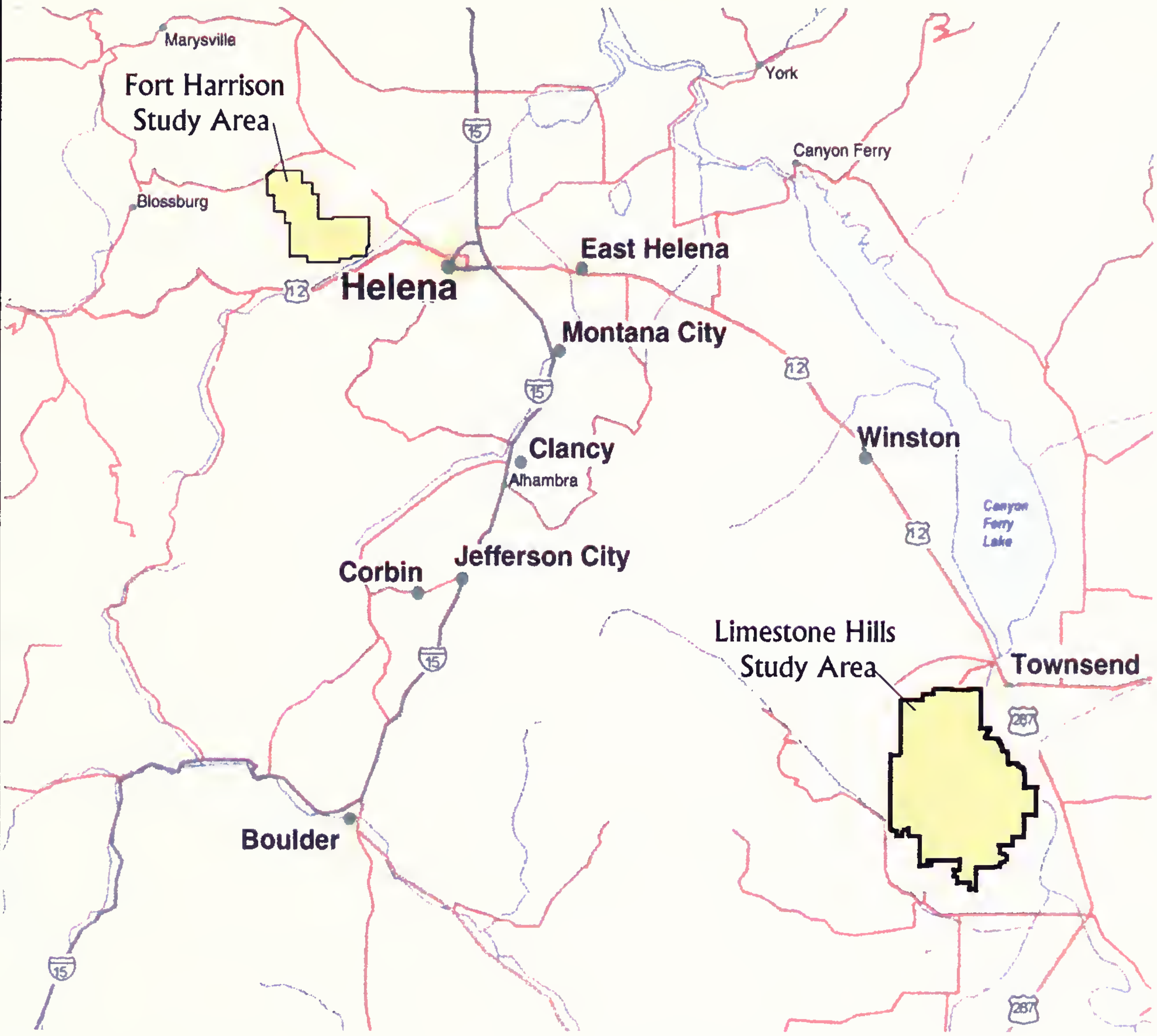
1.3 SCOPE OF THE DOCUMENT

This document was prepared in accordance with the guidance and requirements described in Section 1.1 to evaluate the impact of the proposed transfer of vehicles and associated equipment of a cavalry unit currently located at Fort Huachuca, Arizona. The scope of the EA addresses potential impacts to the biological, physical, and human environs of the affected areas from storage, maintenance, and training activities.

The Proposed Action includes the transfer of a cavalry unit composed of 28 tracked vehicles and associated equipment from the Arizona Army National Guard at Fort Huachuca to the MT ARNG at Fort William Henry Harrison (Fort Harrison) located near Helena, Montana. The alternative to the Proposed Action evaluated in this EA is no transfer of equipment to the Montana National Guard (No Action Alternative). Sites evaluated in the EA include the tank and vehicle storage area and the maintenance building located at Fort Harrison, tank and vehicle use training areas in the Fort Harrison training areas, and the Limestone Hills training area located approximately 35 miles south of Fort Harrison (Figure 1).

1.4 ISSUES OF CONCERN

Issues of concern raised during the scoping process of this EA include (1) the ability of the MT ARNG to fulfill its mission to maintain combat readiness, (2) potential air quality impairment from fugitive dust, (3) risk from explosive ordnance, (4) soil erosion from tracked vehicles, and (5) damage to archeological sites.



No Scale

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 1
ENVIRONMENTAL ASSESSMENT
LOCATION MAP

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SECTION 2.0: DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action includes the transfer of a cavalry unit (the 118th Cavalry Unit) currently located at Fort Huachuca in Arizona to Fort Harrison in Helena, Montana. After the 118th Cavalry Unit is transferred, the MT ARNG would decommission 17 M1 Abrams tanks currently used for training the 2-163rd Armored Battalion. The M1 Abrams tanks would be transferred outside of Montana for upgrades and distribution for other Army use. The Proposed Action includes reassignment of approximately 180 MT ARNG personnel currently serving in the 2-163d Armored Battalion to the 118th Cavalry unit and other units, and the transfer of 118th Cavalry Unit equipment (tracked vehicles, wheeled vehicles, guns, and other equipment) to the MT ARNG. This section describes the type of equipment and the transport, maintenance, and use of the cavalry unit vehicles and associated equipment.

2.1 EQUIPMENT TO BE TRANSFERRED FROM THE MT ARNG

Seventeen M1 Abrams combat tanks would be decommissioned and transported out of Montana. The M1 Abrams is a full-tracked combat tank similar to the more advanced M1A1 combat tank. Its primary armaments are a turret-mounted 105 millimeter (mm) cannon, two 7.62 mm machine guns, and a .50 caliber machine gun. The M1 Abrams combat tank was developed in the late 1970s and was designed for increased survivability, fire power, and mobility over what had been provided by its predecessor, the M60 tank series. The M1, like the M1A1, is powered by a 1,500 horsepower turbine engine, but lacks the improved armor, advanced engine filtration system, and improved air protective systems found on the M1A1 tank.

2.2 EQUIPMENT TO BE TRANSFERRED TO THE MT ARNG

Heavy equipment transferred with the Cavalry Unit would include 28 tracked vehicles, 14 wheeled vehicles, 24 wire-guided missile simulation rounds, 2 mortar carriers, and 4 trailers. A summary description of heavy equipment provided in Table 1 and described in more detail in Appendix B. Some Cavalry Unit vehicles and equipment may be transported to other MT ARNG training facilities in the future and would be maintained and used for training on a limited basis at those facilities. The timing of the transfer and the number and type of vehicles to be transferred to other MT ARNG facilities are not yet determined and may or may not occur. For

this EA, the Proposed Action does not include subsequent distribution of Cavalry Unit vehicles and equipment to MT ARNG facilities outside of Fort Harrison and the Limestone Hills.

TABLE 1
HEAVY EQUIPMENT TRANSFER FROM FORT HUACHUCHA, ARIZONA TO FORT HARRISON, MONTANA

Equipment	Amount	Description
M1-A1	9	Full-tracked combat tank with 120 millimeter gun 12 feet wide; 9.5 feet high; 63 - 67.7 tons; Governed speed is 42 miles per hour; 19-inch ground clearance; track is 25-inches wide, 126 square inches in road wear area; requires a 4-person crew; includes 120 mm main gun and up to 3 machine guns. Fuel storage capacity is 495 gallons. Typically runs on diesel but is a multi-fuel vehicle.
CFV M-3	13	Cavalry Fighting Vehicle; full tracked; 17 feet wide; 31 feet long; 14 feet high; 67,000 pounds. Maximum sped of 41 mph with a 300-mile range.
M113-A2	4	Full-tracked armored personnel carrier. Carries up to 12 combat-ready troops; 15.9 feet long; 8.8 feet wide; and 8.2 feet high. Maximum speed is 38 mph, range is 300 miles, requires a crew of 2.
M-577-A2	1	Light-tracked command post carrier
TOW	24	Tube-Launched, Optically-Tracked, Wire-Guided Weapon System. Anti-armor missile using a thin copper wire for guidance. Would be mounted on CFVs
M-88A1	1	Full-tracked recovery vehicle. Armor-protected vehicle used to retrieve disabled armored combat vehicles. It is 27 feet long; 11.25 feet wide; 10.25 feet high; 112,000 pounds. Maximum speed is 26 mph, range 300 miles.
120 mm Mortar and Carrier	2	120 mm mortar and Carrier 120 mm mortar is a self-propelled armor carrier The carrier has the same engine and body shape as the M-577 vehicle but is 2 feet lower and equipped with hatch doors to facilitate use of the 120 mm mortar. The mortar fires 4 rounds per minute, with a maximum range of 4.5 miles. Uses high explosive ammunition.
Cargo Truck	2	Tactical 8X8 expanded mobility cargo truck
M-998	2	1 ¼ ton 4X4 cargo/troop carrier utility truck
M-1009	1	¾-ton utility truck
M-978	4	2,500-gallon 8X8 tank fuel servicing truck
M-105-A2 and A1	2	1 ½-ton 2-wheel cargo trailer
M-149-A2	2	1 ½-ton 2-wheel, 400 gallon water tank trailer
M-35-A2	4	2 ½-ton 6X6 cargo truck
M-35-A2	1	2 ½-ton 6X6 cargo truck with winch
	shaded cells indicate tracked vehicles (tanks and other armored vehicles)	

2.2.1 M1A1 Combat Tanks (9)

The M1A1 is a full tracked combat tank with high agility, increased lethality, and a low silhouette. It is an improved version of the M1 Abrams Main Battle Tank (M1 MBT) that is currently used at Fort Harrison and will be removed from the MT ARNG for upgrading and redistribution. Operation and maintenance of the MIA1 combat tank are similar to the older M1

MBT currently in use by the MT ARNG. These two tanks are virtually identical in overall size, shape, and engine. The major differences are in the main gun (the M1 MBT has a 105 mm gun; the M1A1 has a 120 mm gun), and the weight (the M1 MBT is approximately 60 tons [not full-battle weight], while the M1A1 is approximately 63 tons [not full-battle weight] or 5 percent heavier than the M1 MBT) (Iowa Army National Guard 1995). Improvements in the MIA1 that would not affect the environment include: an improved armor package, an over pressure system, a deep water fording kit (there are no perennial bodies of water located in driver's training areas), a position location reporting system, enhanced ship tie down, digital electronic control unit (for fuel savings), and battlefield override. An Army fact sheet providing additional information is included in Appendix B.

2.2.2 Cavalry Fighting Vehicles (13)

The CFV is a full-tracked, lightly armored, highly mobile infantry vehicle with a turret-mounted 25mm chain gun, turret mounted machine gun, firing ports for troops, and a missile launching device. The CFV has a track width of 21 inches. The vehicle is 31 feet long and 14 feet high and weighs approximately 30 tons (combat ready). The CFV can obtain speeds up to 41 mph and has a cruising range of 300 miles.

2.2.3 M113-A2 Armored Personnel Carriers (4)

The Armored Personnel Carrier (M113-A2) is a lightly armored, full-tracked combat vehicle that provides protected transportation for troops or cargo in combat. The vehicle can carry up to 12 combat-equipped troops. The M113-A2 is 15.9 feet long, 8.8 feet wide, and 8.2 feet high. It has a range of 300 miles, a road speed of 38 mph, and requires a crew of two.

2.2.4 M-577-A2 Command Post Carrier (1)

The M-577 tracked command post carrier (M-577) is a standardized integrated command post system designed to house the Army Battle Command System across all Battlefield Functional Areas. The M-577 contains an onboard 5 kilowatt (kW) generator, equipment tracks, internal lighting, power and signal import and export panels, internal wiring and cabling, vehicular intercom system, and workspace for workstations and operators.

2.2.5 Tube-Launched, Optically Tracked, Wire-Guided Weapon System (TOW) (24)

The TOW weapon system is an anti-armor missile capable of tracking targets in poor visibility and all weather conditions. Guidance of the missile to its target is controlled by a thin wire. The system is composed of a reusable launcher, a missile guidance set, and a sight system. It can be mounted on a tripod. This system would be mounted on Cavalry Fighting Vehicles and on high mobility, multipurpose wheeled vehicles (HMMWV).

2.2.6 M-88A1 Recovery Vehicle (1)

The M-88A1 is an armor-protected recovery vehicle used to tow, winch, and lift disabled armored combat vehicles. It is also used to support critical maintenance operations such as engine replacement of vehicles undergoing battlefield maintenance. The vehicle weighs 112,000 pounds (56 tons), is 27 feet long, 11.25 feet wide, and 10.25 feet high. Maximum speed is 26 miles per hour. Range is 300 miles.

2.2.7 Carrier 120 mm Mortar (2) and M-120 Mortar (2)

The Carrier 120 mm mortar is similar to the M-577 (described in Section 2.1.5) with the addition of a 120 mm mortar and a lower profile. The 120 mm mortar is smooth bored, muzzle-loaded, and provides indirect fire support for light battalions. The mortar fires four rounds per minute, with a maximum range of 4.5 miles. Ammunition used is a high explosive that generates smoke and illumination.

2.2.8 Wheeled Equipment (14)

Fourteen trucks will also be transferred to Fort Harrison ranging in weight from ¾ to 5 tons, and in size from 8-wheeled cargo trucks to a ¾-ton utility truck (Table 1).

2.2.9 Nonvehicular Equipment

Additional equipment that would be transferred with the Cavalry Unit include accessory kits, chemical agent alarms, and aiming circles (Table 2).

TABLE 2 ADDITIONAL EQUIPMENT TRANSFER FROM FORT HUACHUCHA, ARIZONA TO FORT HARRISON, MONTANA	
Equipment	**Quantity**
Various equipment accessory kits	50
Various adapter hardware	2
Automatic chemical agent alarm: portable man pack	11
Aiming circle	2
Analyzer set engine	1

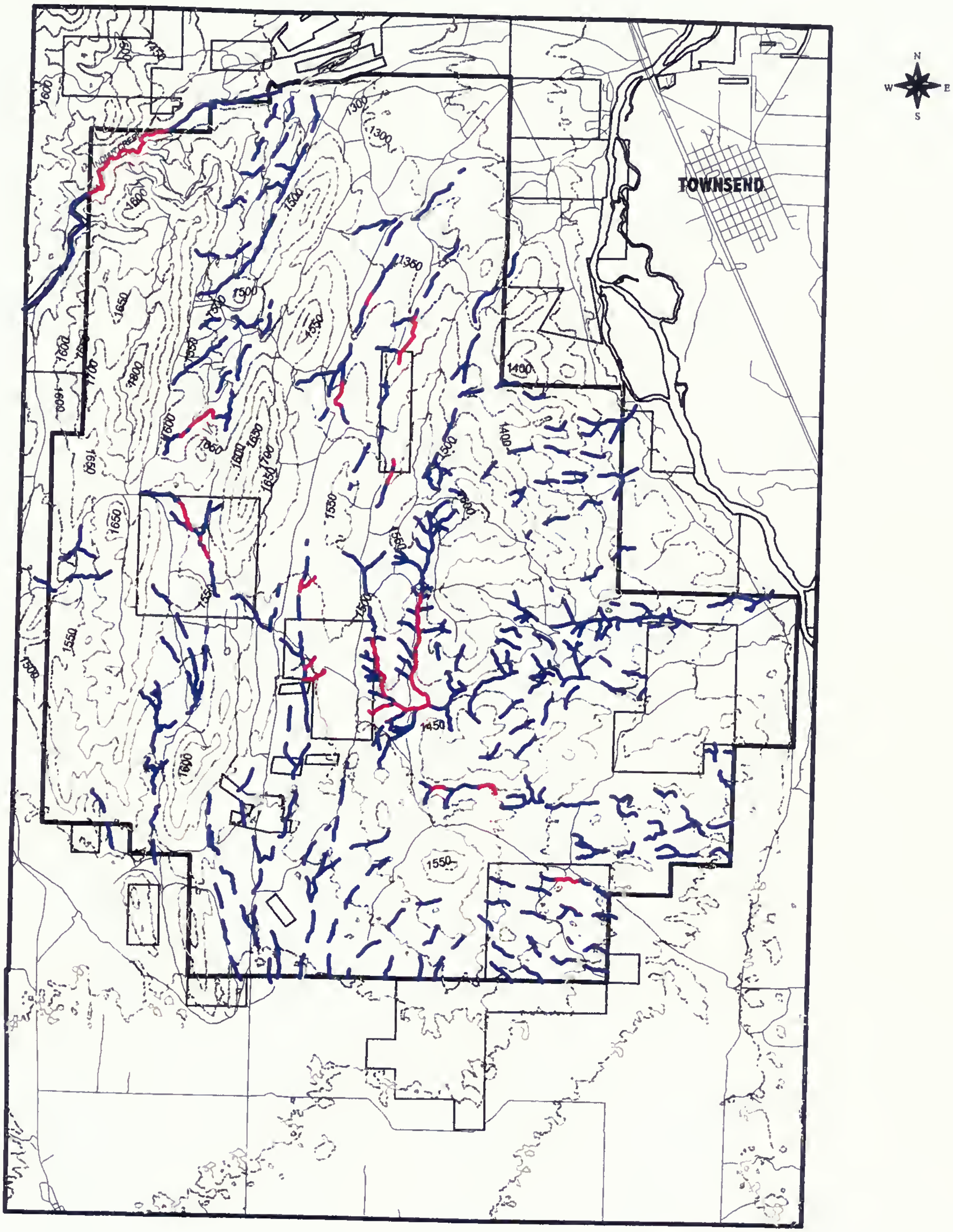
2.3 PROPOSED EQUIPMENT TRANSPORT METHODS

The Army proposes to transport all vehicles and equipment to Fort Harrison by rail. After reaching Fort Harrison, tracked vehicles would be transported to the Limestone Hills training area by commercial truck (Figure 2A). Wheeled vehicles would be transported within Montana under their own power.

2.4 PROPOSED VEHICLE STORAGE AND MAINTENANCE PROGRAM

All tracked and wheeled vehicles would initially be stored in the vehicle storage area located at Fort Harrison (Figure 2B). The vehicle storage area is an unpaved, uncovered parking area that is secured by a locked chain link fence. Maintenance would take place in a large enclosed garage capable of providing work space for multiple armored vehicles at one time. All vehicles are inspected at least once a year and are cleaned and lubricated in the shop at least once per year. Liquids used for lubricating and cleaning equipment are stored inside the building in original containers. Used oil is collected and recycled. Most cleaning solutions are composed of biodegradable solvents. After arrival at Fort Harrison, some tracked vehicles may be transferred to another MT NARG facility. A limited number of vehicle transfers (expected to be between two and four) are likely to be transported to the Missoula MT ARNG armory training facility for driver's training exercises on an existing track. The timing of the transfer and the specific number and type of vehicles to be transferred are unknown.

No appreciable changes in storage facility use or maintenance operations from present activities are anticipated because the number of vehicles stored and maintained would not significantly increase due to the subsequent decommissioning of 17 tracked vehicles. No additional fuel



3000 0 3000 6000 Feet

LEGEND

- Wetlands
- Streams
- Roads
- Topography
- Withdrawl Boundary
- Ownership Boundaries

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 3A
ENVIRONMENTAL ASSESSMENT
STREAMS AND WETLANDS

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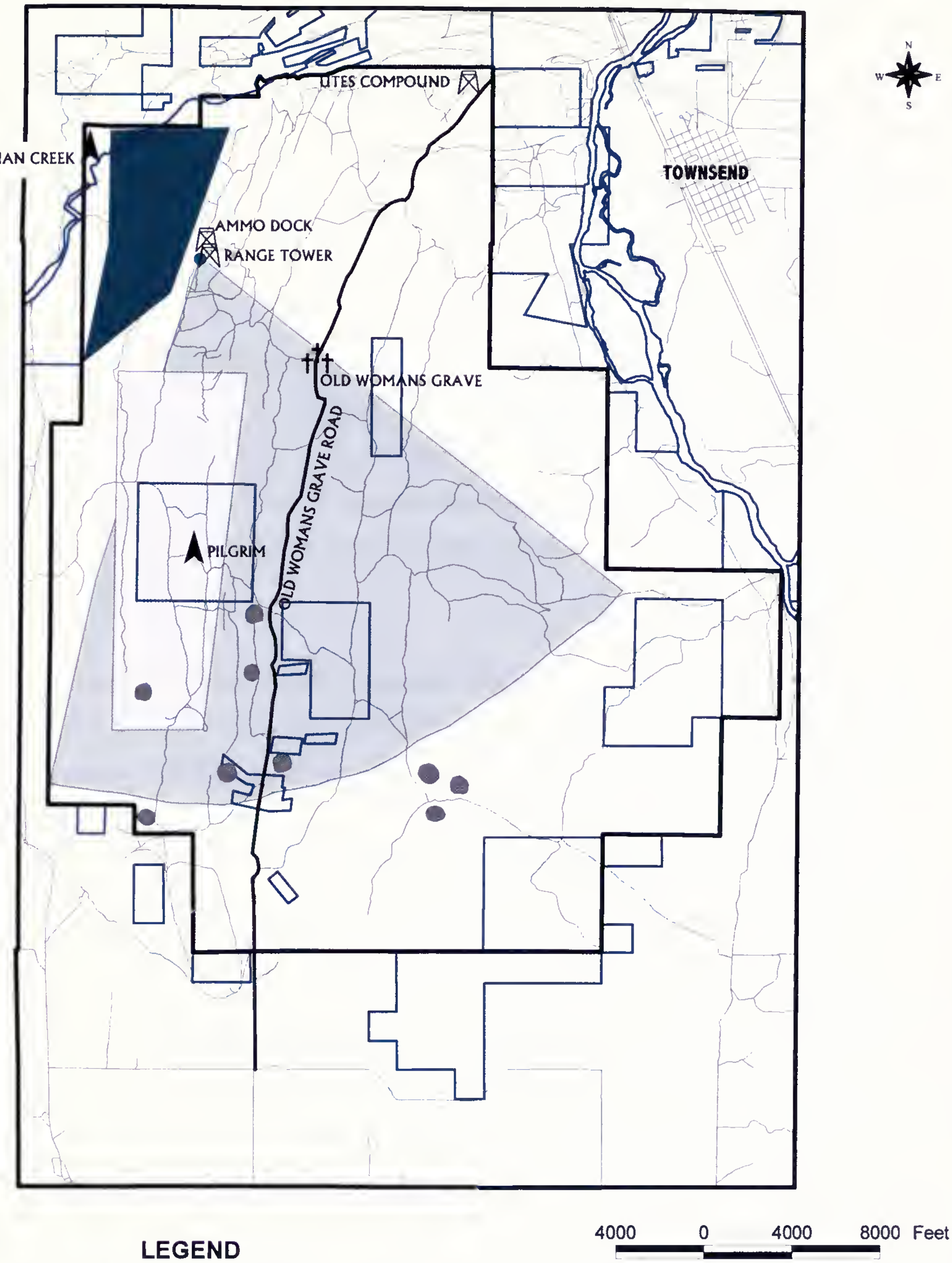

LEGEND

- Archaeological Sites
- Landmarks
- Cemetery
- Range Point
- Limestone Hills Boundary
- Roads
- Active Impact Area
- Ownership Boundaries
- Powder Burn Areas
- Surface Danger Zone
- Continental Lime Mine

See APPENDIX A for data sources

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 2A
ENVIRONMENTAL ASSESSMENT
SITE MAP

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storage tanks would be installed or maintenance personnel added as a result of the proposed action.

2.5 PROPOSED USE OF VEHICLES

The proposed use of the tracked and wheeled vehicles is for field training and military combat.

2.5.1 Training Uses

Tracked vehicle maneuver training would be restricted to the Limestone Hills training area and Fort Harrison for Tank Crew Proficiency Course training (Martinka 1998). Tank maneuvering is defined as the movement of tanks during training exercises. Maneuver training consists of simulated battlefield drills and formations, reconnaissance exercises, and the establishment of defense positions. Gunnery training from tank guns and other heavy artillery would be restricted to the Limestone Hills.

Cavalry Unit personnel would use the Limestone Hills ranges to qualify tank crews on M1A1 armament. Tank gunnery exercises would be identical to those carried out with the M1 MBT and would consist of firing the 120 mm main gun and the .50 caliber and 7.62 mm machine guns at stationary, moving, and popup targets at various distances both day and night. Gunnery operations would be conducted while the tank is stationary as well as while it is moving. Use of Cavalry Unit vehicles at the Limestone Hills would be approximately 5 to 6 weekends per year, and possibly a 10-day weekday training period between mid-April and November. Tracked vehicle maneuver training would take place within the leased boundary area and on existing roads (shown on Figure 2A). Drivers training exercises would not include fording streams or crossing wetlands areas. Shooting practice would include the use of heavy and light artillery (all guns listed in Table 1). Shooting of heavy artillery would take place in the vicinity of the range tower in the Limestone Hills and would not affect areas outside of the surface danger zone shown on Figure 2A. The trajectory of fired ordnance from the range tower area is such that most or all of fired ordnance lands inside the active impact area shown on Figure 2A. The proposed active impact area is the same at the existing impact area. In addition, mortars would be fired from the southern portion of the leased area in the vicinity of existing powder burn areas

that signify the location of previously fired mortars (Figure 2A). Most activities using Cavalry Unit equipment would take place west of Old Woman's Grave Road (Figure 2A).

Cavalry Unit vehicles fielded at Fort Harrison would be used for maneuver training approximately 6 to 7 times per year for 12- to 14-day periods. Tank maneuvers would be practiced within the track area and on existing roads to and within the Tracked Vehicle Bivouac area (Figure 2B). Light artillery shooting training at Fort Harrison would continue to take place about 1 weekend per year and would occur at the firing range points and range fans shown on Figure 2B. No service ammunition would be fired on Fort Harrison's tank ranges; only target practice rounds would be used. Training typically takes place between April and October. These proposed exercises would be similar to existing conditions using tracked vehicles dedicated to the 2-163rd Armored Battalion currently in place at MT ARNG facilities.

All vehicle maneuver and shooting exercises would be conducted in accordance with MT ARNG standard operation procedures for safety precautions. Driver's training for the M1A1 tank would be conducted throughout the installation on established tank trails. Additional safety precautions for vehicle maneuvers on the track would include (1) track inspection before use, (2) a limit on vehicles to only one direction of movement around the track, and (3) use of a single designated roadway to and from the track.

2.5.2 Military Readiness

Because the federal government is reducing the size of active duty military forces and military bases, the National Guard must assume additional responsibility to maintain combat readiness for national defense. The federal government has recognized the need for a combat-ready National Guard by providing upgraded training equipment whenever possible. The Proposed Action provides upgraded versions of tracked vehicles currently used for training by MT ARNG personnel.

2.6 Personnel Reorganization

Approximately 177 personnel currently serve in the 2-163rd Armored Battalion. When the Battalion is decommissioned, those personnel would have several options for reassignment that

include the Cavalry Unit transferred under this Proposed Action, other units within the MT ARNG, or they could choose to leave the MT ARNG. No new personnel would be needed as a result of the Proposed Action, nor would existing personnel be required to move from one location to another. The 2-163rd Armored Battalion is based in Kalispell but has detachments in Helena, Missoula, Shelby, Whitefish, Libby, Deer Lodge, Hamilton, and Havre. Because the gunnery range is located at Limestone Hills, 35 miles south of Helena, and the Montana Army National Guard is headquartered in Helena, the new Cavalry Unit would be based in Helena. Personnel that transfer from the 2-163rd to the Cavalry Unit would most likely come to Helena for training.

SECTION 3.0: ALTERNATIVES CONSIDERED

Alternatives represent the various ways the Army can fulfill the purpose and need that would be achieved by initiating the Proposed Action. This section describes all reasonable alternatives to the Proposed Action that were considered for further evaluation and explains reasons for rejecting alternatives. It also describes the No Action Alternative.

3.1 ALTERNATIVES DEVELOPMENT

The Council on Environmental Quality (CEQ) requires an evaluation of reasonable alternatives to the Proposed Action that would fulfill the purpose of and need for the Proposed Action. Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint, support the underlying purpose of and need for the Proposed Action, and are ready for decision. Alternatives considered but eliminated from detailed study included one or both of the following:

1) Partial transfer of Cavalry unit vehicles and equipment from Fort Huachuca to Fort Harrison
2) Retention of all or part of the 2 163d Armored Battalion and the 17 M1 combat tanks currently in place at Fort Harrison.

These alternatives were considered but eliminated from detailed study because they do not fulfill the purpose of and need for the Proposed Action: to maintain combat readiness. A Cavalry Unit must include the entire complement of vehicles and equipment to be effective in training exercising and combat readiness. The 17 M1 Abrams combat tanks currently in use at Fort Harrison are outdated and do not provide adequate training opportunities on updated vehicles.

3.2 ALTERNATIVES TO THE PROPOSED ACTION

There are no reasonable alternatives to the Proposed Action other than the No Action Alternative.

3.3 NO ACTION ALTERNATIVE

The No Action Alternative would forego the transfer of a Cavalry Unit including the importation of armored tracked vehicles, wheeled vehicles, and associated equipment described in Section

2.0 to MT ARNG facilities. The 2-163rd Armored Battalion would be decommissioned with a transfer of associated vehicles and equipment described in Section 2.0, regardless of the Proposed Action. Tank training exercises would not occur at the Fort Harrison and Limestone Hills training areas. Firing ranges in both training areas would continue to be in use.

For those and other specific reasons outlined below, the No Action Alternative does not represent the best interests of the MT ARNG as it does not allow the Montana Guard units using this facility to obtain the type and quality of training that will allow them to fulfill their primary mission swiftly and effectively. However, the No Action Alternative is included in the EA to provide baseline conditions for comparison.

SECTION 4.0: AFFECTED ENVIRONMENT

This section describes the human environment of the Limestone Hills and Fort Harrison study areas. The baseline information provided in this section allows the evaluation of potential environmental impacts that could result from the Proposed Action and the No Action Alternative. As stated in 40 CFR §1508.14, the human environment includes natural and physical resources and the relationship of people to those resources. The environmental baseline or resource areas described in this chapter were selected after identifying the potential issues and concerns of the Proposed Action and the No Action Alternative.

Only relevant resource areas are described; resource areas that would not be affected are not described in this section nor evaluated in Section 5. The resource areas that may be affected by the Proposed Action and the No Action Alternative include general location, land use, air resources, noise, geology and soil resources, water resources, biological resources, cultural resources, socioeconomics, facility infrastructure, and operational safety.

The location and extent of affected environment study areas depend on the resource under evaluation. The study areas for land use, geology, soils, water, biological resources, facility infrastructure, and operational safety are the same as and equal to the legal boundary of the Limestone Hills and Fort Harrison (Figures 2A and 2B). The study areas for general location (climate), socioeconomic, and air resources extends outside the boundaries of the Limestone Hills and Fort Harrison training areas and are defined at the beginning of each section.

4.1 LOCATION DESCRIPTION

This section provides a general overview of the environmental setting for the affected environments. This section describes the geographic settings, primary activities, general landscape and general climate of the Limestone Hills and Fort Harrison training areas. The affected environment includes the entire Limestone Hills training area (Figure 2A), and the Fort Harrison training area and vehicle storage and maintenance area (Figure 2B).

4.1.1 Geographic Setting

The Limestone Hills training area is located in Broadwater County west of the Missouri River and about 2 miles west of the town of Townsend, Montana. The Limestone Hills are approximately 35 miles southeast of Fort Harrison (Figure 1). The study area consists of approximately 20,000 acres in all of Township 6 North, Range 1 East, and Sections 26, 27, 28, 32, 34 and 35 in Township 7 North Range 1 East.

Fort Harrison is located in Lewis and Clark County, approximately 3 miles northwest of Helena, Montana (Figure 1). The study area, for the purposes of this EA, encompasses approximately 6,200 acres located in Township 10 North, Range 4 West, most of Sections 6, 7, 15, 16, 17, 18, 19, 20, 21, 22, and 29 and Township 5 North, Range 10 West, Section 1. The Fort Harrison study area includes the vehicle storage lot and associated maintenance facility; the firing range area; track; and a training area (Bivouac Area) located in the northwest portion of the fort grounds (Figure 2B).

4.1.2 Mission

The Montana National Guard is charged with meeting the mandates of the United States Constitution and the Montana Constitution. The Guard's three missions are to participate in global security for the United States, to provide emergency response at the state level, and to support local community needs. National Guard units are organized, trained, and equipped to the same standards as the U.S. Army and the U.S. Air Force. The MT ARNG is a part of the national force structure and as such, must be prepared to use military equipment effectively. Fort Harrison serves as a training site for all branches of the military; more than 110,000 troops come to train at the Limestone Hills and Fort Harrison each year.

4.1.3 General Landscape of the Area

The Limestone Hills form the eastern foothills of the Elkhorn Mountains. Elevations in the training area range from about 3,865 feet (1,300 meters) above mean sea level (AMSL) near the Missouri River to about 5,500 feet (1,800 meters) AMSL along a ridge near the west boundary of the training area (Figure 3A). The west part of the Limestone Hills training area (the area west

of Old Woman's Grave Road [Figure 2A]), is characterized by two steep, rocky ridges divided by a narrow dry valley (Figure 3A). The ridges are dominated by limestone outcrops.

Fort Harrison lies in the foothills on the eastern slope of the Rocky Mountains, approximately 10 miles from the Continental Divide. The study area is sloped toward the Helena Valley (to the northeast) as is evidenced in surface water patterns (Figure 3B). Most of the study area consists of gentle-to-steep rolling foothills, ranging in elevation from about 4,050 feet AMSL to 5,330 feet AMSL.

4.1.4 General Climatic Conditions

The Limestone Hills and Fort Harrison are located within 35 miles of each other, both in intermontane valleys east of the Continental Divide, and have a semiarid climate with similar weather patterns. The Limestone Hills are located at the western boundary of the Townsend Valley. Average annual precipitation is 10.7 inches, and average annual snowfall is 24 inches. Most of the precipitation falls from May through August, and winds are generally westerly (Western Regional Climate Center 1998). Fort Harrison is located in the Helena Valley, bounded on the west by the Rocky Mountains, on the south by the Elkhorn Mountains, and on the east by the Little Belt Mountains. Summertime temperatures are moderate, with maximum daily readings generally under 90° F and daily minimums near 50° F (Helena Chamber of Commerce 1998). The extreme summer temperatures are 105° F and 18° F. Daily winter maximums are near 30° F and minimums are 10° F to 15° F. The lowest recorded temperature is -42° F (Helena Chamber of Commerce July 1998). Winds are generally westerly throughout the year, averaging 7 to 8 miles per hour. The average annual precipitation is 11.37 inches. Most of the precipitation falls from April through July as frequent showers and thundershowers. June is the wettest month of the year with an average of 2.01 inches of rain (Western Region Climate Center 1998).

4.2 LAND USE

This section provides a description of the land use in the affected environment. A discussion of the affected land use environment is limited to land use currently affected by the 2-163rd Armored Battalion.

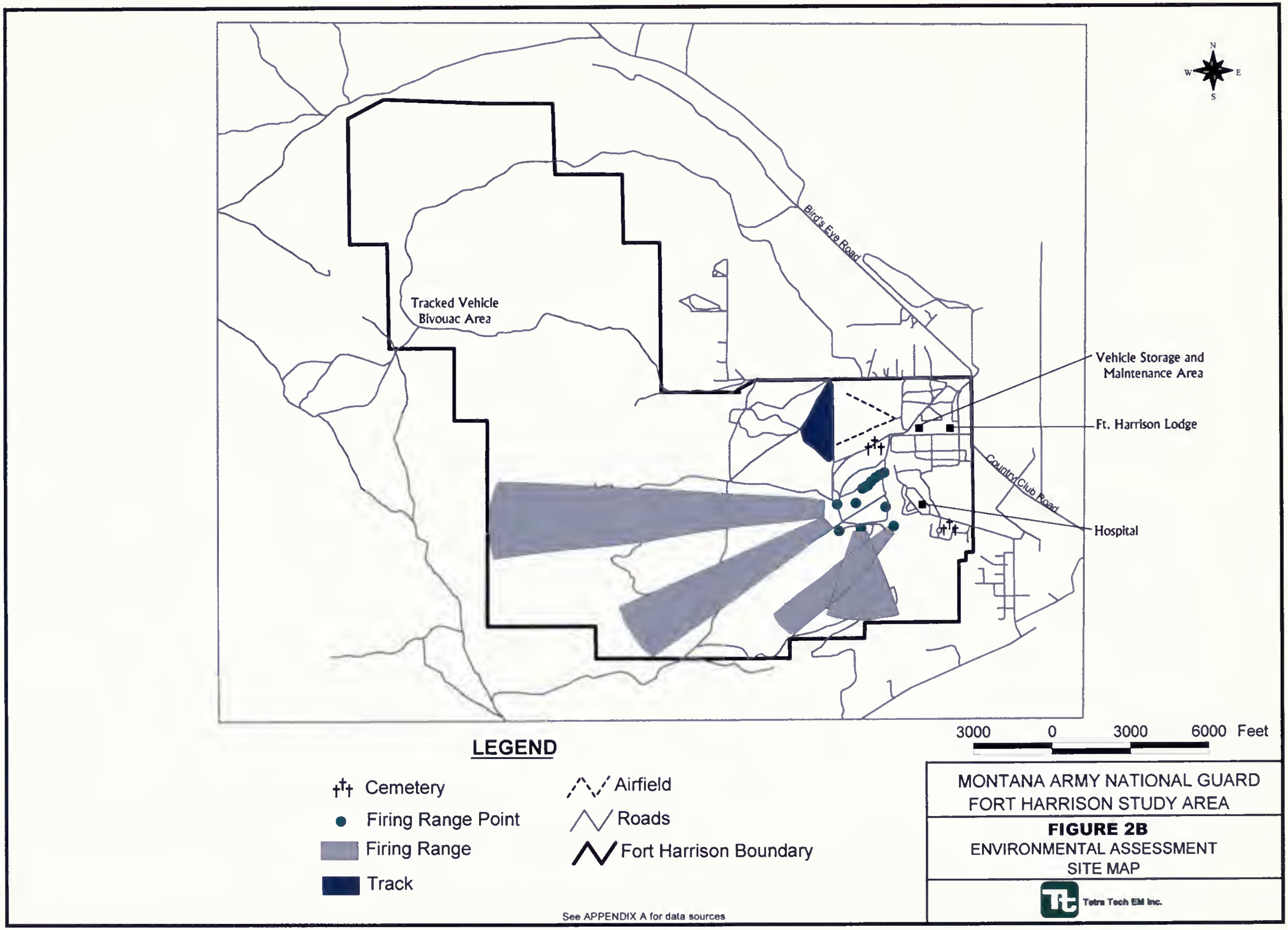
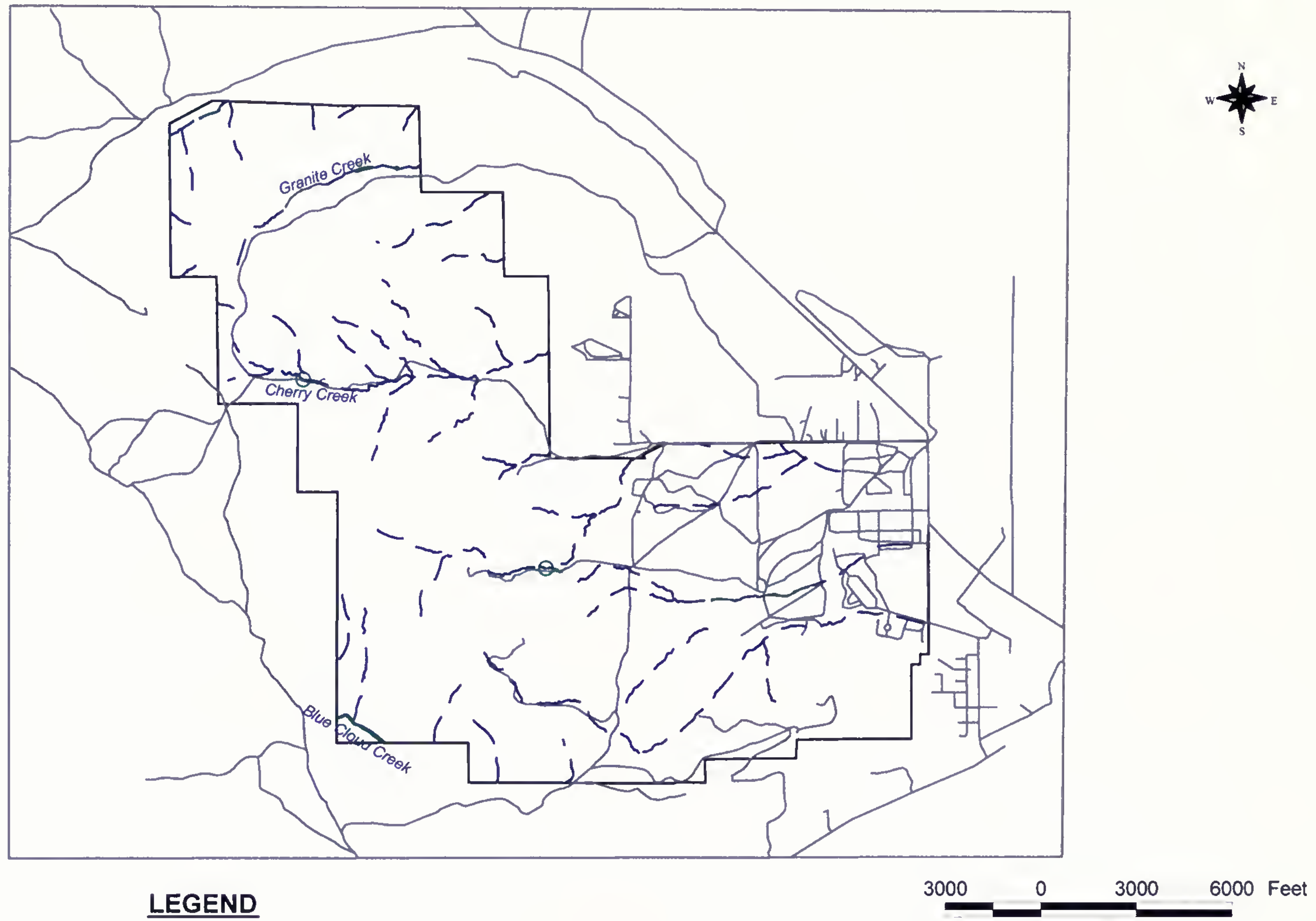


FIGURE 2B
ENVIRONMENTAL ASSESSMENT
SITE MAP



LEGEND

- Wetlands
- Intermittent Streams
- Springs
- Roads
- Fort Harrison Boundary

See APPENDIX A for data sources

MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA

FIGURE 3B
ENVIRONMENTAL ASSESSMENT
STREAMS AND WETLANDS

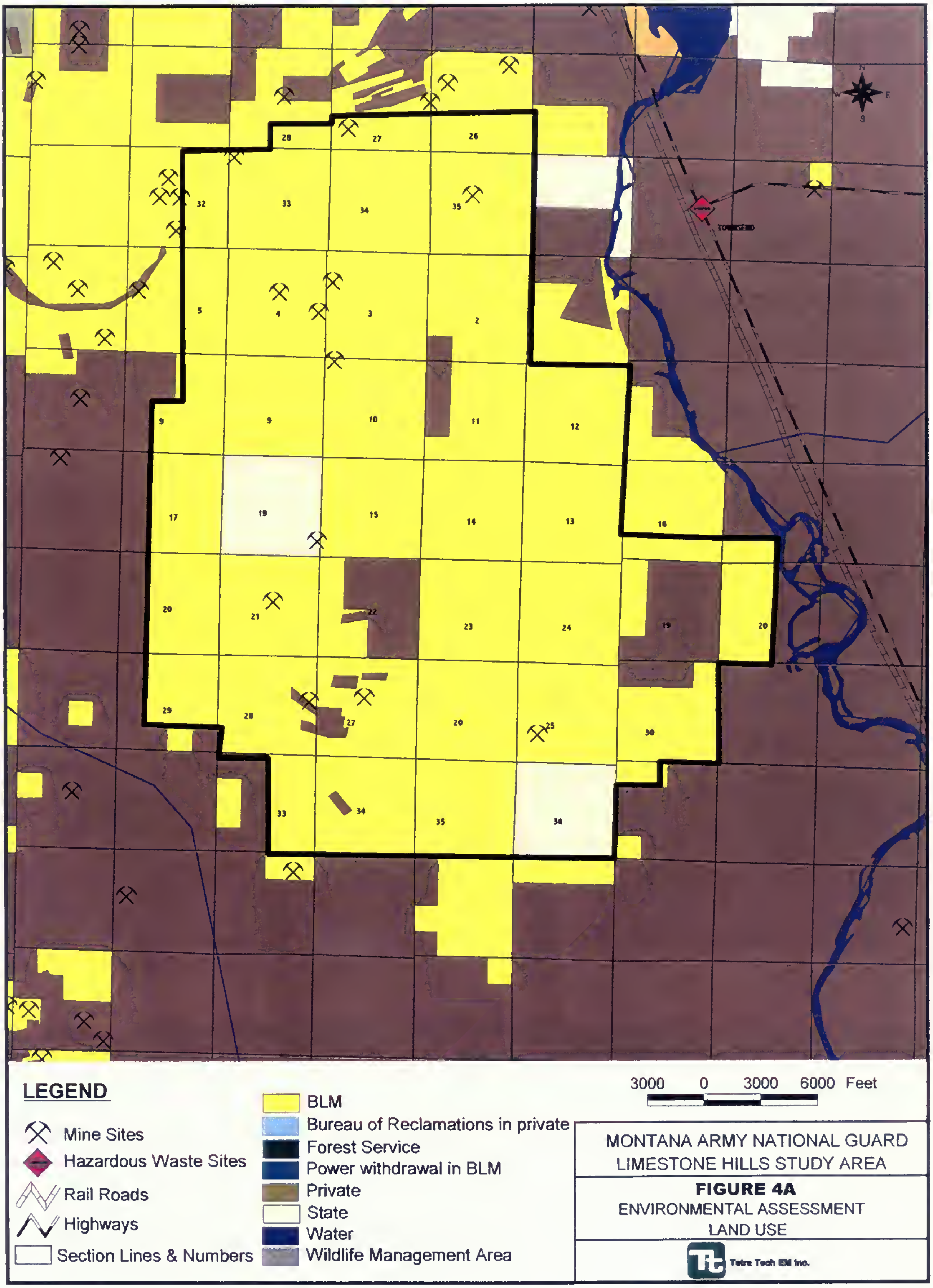
Tetra Tech EM Inc.

Tank maneuver exercises are currently conducted on roads and firing areas within the leased boundaries of Limestone Hills (Figure 2A) and Fort Harrison (Figure 2B). Maneuver training currently consists of simulated battlefield drills and formations, reconnaissance exercises, and the establishment of defense positions. Training includes the use of M-88 tank recovery vehicles, 2,500-gallon fuel tankers (HEMM-T), and a number of other support vehicles. Driver's training for tracked vehicles is currently conducted throughout the installation on established tank trails. The 2-163rd Armored Battalion has been training at the Limestone Hills for 6-month training periods that typically occur between mid-April and October 15, depending on weather conditions and disturbance of big game habitat (see Section 4.7.5). Weekend drills are presently conducted about 2 weekends per month, with approximately 600 soldiers attending each drill. Each armor unit conducts a 2-week annual training drill at Fort Harrison between May and September. All vehicles are stored and maintained in the vehicle storage and maintenance area shown in Figure 2B. Visiting soldiers are housed in the Fort Harrison Lodge (Figure 2B)

4.2.1 Existing Land Use

The Limestone Hills area is composed primarily of federally owned land managed by the U.S. Bureau of Land Management (about 88 percent). Approximately 6 percent of the remainder is state-owned land, and another 6 percent is privately owned (Figure 4A). This land is used exclusively for military training exercises year-round with the exception of about a 5 1/2 -month period from December 1 (or the last day of hunting season) to April 15 when access is restricted to protect big game wildlife habitat (Montana Department of Fish, Wildlife and Parks [FWP] 1998).

Historical land use of the Limestone Hills study area included mining (numerous abandoned prospects and mines are present in the area, as shown in Figure 4A), livestock grazing, and wildlife habitat. Recent land use includes military training, mining (a large limestone mine is present in the northwestern portion of the area, as shown in Figure 2A), livestock grazing (cattle and domestic sheep graze on both public and private lands), wildlife habitat (mule deer and elk winter use), and recreation (hunting and motorcycle use, all terrain vehicle, and mountain bike use). Access to 8,000 acres of public land is restricted west of Old Woman'g Grave Road due to the potential hazard posed by unexploded ordnance (UXO).

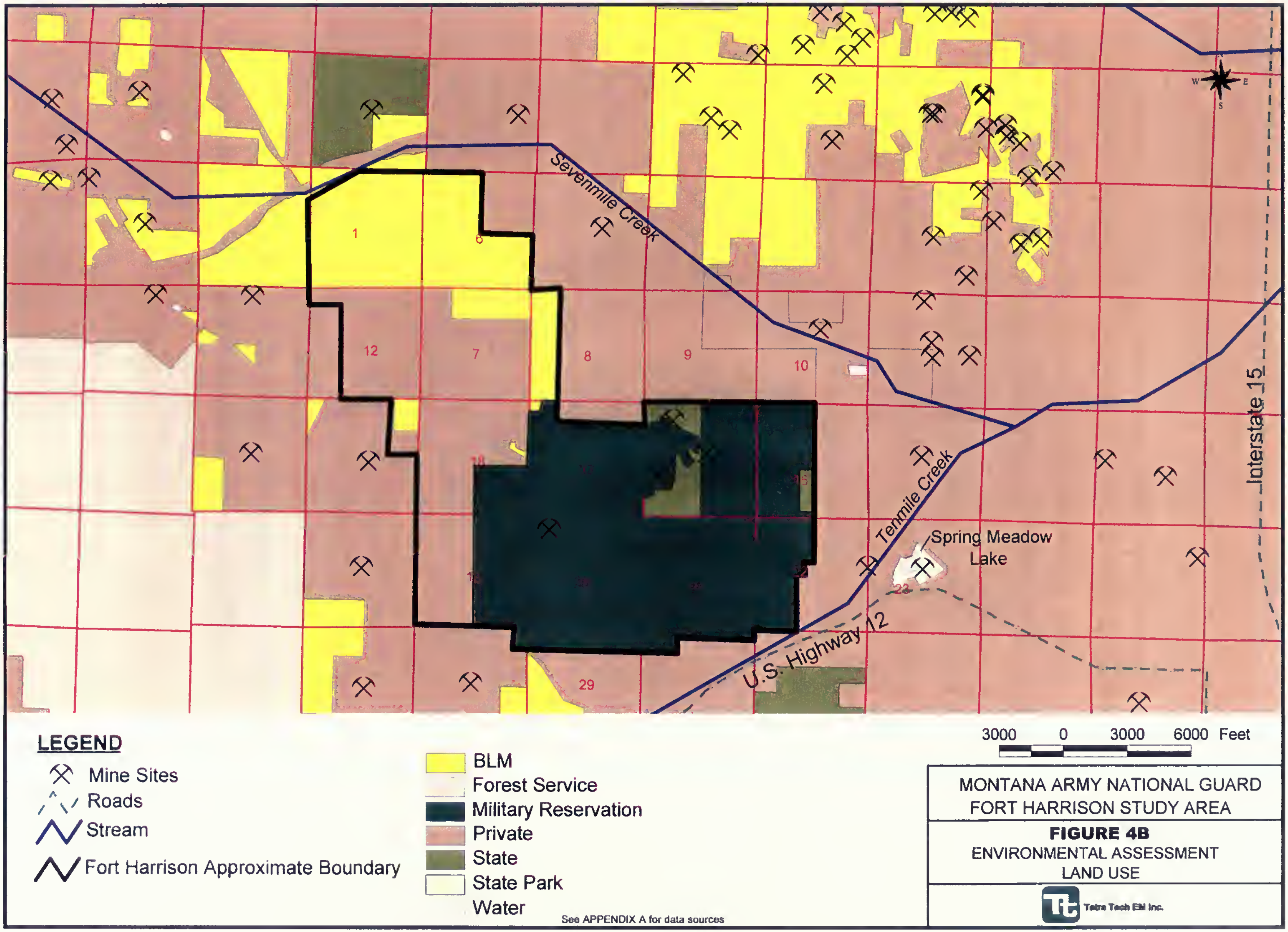

LEGEND
Mine Sites
Hazardous Waste Sites
Rail Roads
Highways
Section Lines & Numbers
BLM
Bureau of Reclamations in private
Forest Service
Power withdrawal in BLM
Private
State
Water
Wildlife Management Area
3000 0 3000 6000 Feet
MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA
FIGURE 4A
ENVIRONMENTAL ASSESSMENT
LAND USE
Tetra Tech EM Inc.

Fort Harrison, a major Army training area, comprises 2,154 acres in west-central Montana. An additional 4,117 acres of land are leased or permitted for use (Figure 4B). Land use within Fort Harrison includes a cantonment area with lodging and dining, latrine facilities, and site support operations, ranges for small arms qualification, training track and roads, and a helicopter landing area (Figure 2B). Land on the southern perimeter of Fort Harrison is occupied by the Veterans Administration. Several abandoned mine pits are scattered throughout the study area (Figure 4B). Land use to the east, west, and north of Fort Harrison consists of scattered farms and residences, grazing land, and foothills to mountainous terrain. The most recent Lewis and Clark County Comprehensive Plan estimates that in 1983, approximately 40 percent of the Helena Valley was in agricultural use and approximately 30 percent is in residential use (Lewis and Clark County 1983). The remaining is range land and other uses.

4.2.2 Aesthetics and Visual Resources

The rugged topography of the Limestone Hills is immediately noticeable from the east. Steep, north-south trending ridges dominate much of the western half of the study area. The Limestone Hills area is dominated by a long, steep-sided, narrow ridge extending north-south throughout the study area along the west side. These western ridges, composed of limestone, quartzite, and other rocks, present steep and rugged flanks. Two long, wide-bottomed valleys parallel these steep ridges. Indian Creek, the only perennial stream in the study area, flows northeast through the northwest part of the study area (Figure 3A). Indian Creek has cut a narrow, deep gorge through the north end of the Limestone Hills ridge. A number of intermittent spring-fed streams are also present that provide water for at least part of the year to support lush riparian vegetation.

The Fort Harrison study area is surrounded predominantly by agricultural land and residential development (Figure 4B). Terrain to the east, south, and west is generally level with few trees or other natural features. Most of the Fort Harrison study area is composed of rolling foothills with scattered trees at higher elevations.


R5W
R4W
T10N
Sevenmile Creek
Tenmile Creek
Spring Meadow Lake
U.S. Highway 12
Interstate 15
1
6
12
7
8
9
10
29
LEGEND
Mine Sites
Roads
Stream
Fort Harrison Approximate Boundary
BLM
Forest Service
Military Reservation
Private
State
State Park
Water
See APPENDIX A for data sources
3000 0 3000 6000 Feet
MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA
FIGURE 4B
ENVIRONMENTAL ASSESSMENT
LAND USE
Tetra Tech EM Inc.

4.2.3 Building Function and General Architecture

The Limestone Hills training area contains a large cinder block building at the Unit Training Equipment Site (UTES) compound (Figure 2A). Fort Harrison has approximately 90 structures ranging in age from 70 years old to currently under construction. The most modern facilities on the base include the Administration Building and a new Training Support Center. Most of the older buildings were constructed during the 1940s; many of which are vacant and scheduled for demolition. The majority of the buildings constructed before the 1960's are residential in character with wood frame construction, siding and pitched roofs. The more recent facilities are constructed with brick veneer, with either wood or steel back up framing. Roofs are a combination of flat, low slope and high slope with both asphalt shingles and metal roofing materials.

4.2.4 Local Communities

The nearest community to the Limestone Hills study area is Townsend, Montana, located approximately 2 miles east of the northeast portion of the study area. The population of Townsend is about 1,635 and the approximate number of families is 750 (U.S. Bureau of the Census 1992). Townsend is the local service area for agriculture including farming and forestry. Employment occupations are diverse with retail trade the highest single employer of city residents.

Fort Harrison is located adjacent to rural residential areas at the outskirts of Helena, Montana. Helena is about 3 miles east of the base with a population of approximately 27,000 in the city and 59,000 in the area (Helena Chamber of Commerce 1998). Helena city residents are employed primarily by local, state and federal government agencies. Approximately 90 residents serve in the armed forces (U.S. Bureau of the Census 1992).

4.2.5 Land Use Management and Development Plans

The Limestone Hills are in Broadwater County. The Broadwater County Comprehensive Plan does not specifically address the Limestone Hills area. No commercial or residential developments are planned within or near the Limestone Hills (McGowan 1998). The Bureau of Land Management (BLM) Resource Management Plan identifies land use for federal land in the Limestone Hills study area as designated for military training exercises (U.S. BLM 1984). Montana Department of Fish, Wildlife, and Parks restricts use of the Limestone Hills area during the period from December 1 to May 15 to protect critical mule deer winter range.

The Fort Harrison study area falls within the area addressed in the Lewis and Clark County Comprehensive Plan and the Helena Area Transportation Plan Boundary (City of Helena 1982). The stated goal of the Lewis and Clark County Comprehensive Plan is to "guide development by considering the possible effects of that development on surrounding land uses, on the costs and provision of public services and on the environment" (Lewis and Clark County 1989). Fort Harrison falls within the area identified in the plan as the Helena Valley Planning Area. Environmental concerns stated in the plan that are applicable to the Fort Harrison study area include: contaminated runoff, seepage from sewage lagoons, noxious weeds, and fuel spills. The plan does not propose land use changes on federally owned lands. The Helena Transportation Plan was completed in 1982 and encompasses the City of Helena and the most heavily urbanized portions of the Helena Valley. The transportation plan recommended major improvements to Green Meadow Drive which is in the vicinity of Fort Harrison.

4.2.6 Zoning

The Limestone Hills have no local government zoning requirements and, with the exception of selected areas outside of Helena, the Helena Valley and surrounding county lands have no zoning restrictions. A County Special Zoning District is present adjacent to the north boundary of Fort Harrison and includes the southeast quarter of Section 9 and the southwest quarter of Section 10, Township 10 North, Range 4 West (Lewis and Clark County 1989). Property owners in the special zoning district have petitioned the county to establish minimum lot sizes.

4.2.7 Property Ownership

The majority of land in the Limestone Hills and Fort Harrison study areas is owned by the federal government (Figures 4A and 4B). There is also some state and leased private land. All buildings in the study area are owned and controlled by the federal government.

4.3 AIR QUALITY

This section describes the existing air quality of the affected environment and regional conditions that influence air quality.

4.3.1 Ambient Air Quality

Air quality at the Limestone Hills and Fort Harrison is generally very good. The affected environment is designated as in attainment for all criteria pollutants by the Montana Department of Environmental Quality.

4.3.2 Air Emission Sources

Air pollution sources in both the Limestone Hills and Fort Harrison study areas include motor vehicles emissions, emissions from refueling operations, and dust. Dust raised by vehicle use and tank maneuvering training exercises is the single largest air emission source of concern at both the Limestone Hills and Fort Harrison.

4.3.3 Air Pollution Control Regulations and Standards

Air quality is determined by comparing area-specific levels of criteria pollutants with National Ambient Air Quality Standards (NAAQS) and Montana Ambient Air Quality Standards (MAAQS). The NAAQS were established by the U.S. Environmental Protection Agency (EPA) to define the allowable concentrations of six criteria air pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter with a diameter of 10 microns or less (PM_{10}), and lead. The NAAQS include maximum concentrations of pollutants that may be reached, but not exceeded, in a given time period. The standards are set to protect human health and welfare.

Areas not meeting ambient air quality standards are designated as nonattainment for the specific pollutant causing violation. Standards are not to be exceeded more than once per year, except for ozone and PM_{10} standards, which are not to be exceeded more than an average of one day per year. The Limestone Hills and Fort Harrison study areas have never been listed as nonattainment areas (Montana Department of Environmental Quality 1998).

4.3.4 Sensitive Receptors

Sensitive receptors are populations that are more susceptible to the effects of air pollution than is the general population. Sensitive receptors include populations found at facilities such as long-term health care institutions, rehabilitation centers, convalescent centers, retirement homes, residences, public schools, playgrounds, child care centers, and athletic facilities. Receptors near localized sources of toxics and carbon monoxide are of particular concern. Both the Limestone Hills and Fort Harrison study areas are within 0.5 miles of a residence.

4.3.5 Compliance with Implementation Plans

The MT ARNG is required to track the total amount of hazardous air pollutants at its facilities under the reporting requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). The totals for Fort Harrison are 0.54 tons per year (actual emissions) and 9.00 tons per year potential emissions (MT ARNG 1998). No hazardous air pollutants are reported for the Limestone Hills area.

4.3.6 Local Meteorological Conditions

The climate in the Limestone Hills and Fort Harrison areas is semi-arid. Climate conditions in the affected environment are described in Section 4.1.4. Factors affecting local meteorological conditions include invasions of maritime air masses from the Pacific Northwest and drainage of cool air into the Helena and Townsend Valleys from the surrounding mountains. In the case of Fort Harrison, the mountains to the north and east deflect shallow air masses of invading Arctic air to the east. Cold air can collect in the valley and be trapped by inversions for several days during the winter and early spring months.

4.4 NOISE

Sounds that disrupt normal activities or otherwise diminish the quality of the environment are designated as noise. Noise can be stationary or transient, and intermittent or continuous. Community response to noise is based on a subjective assessment of the daily noise environment. Factors that affect this subjective assessment include the noise levels of individual events, the number of events per day, and the time of day the events occur. Most environmental descriptors of noise are based on these three factors.

4.4.1 Noise Sources

Stationary noise sources currently in the study areas include the firing ranges and the UTES and vehicle maintenance buildings (Figures 2A and 2B). The noise zones for the small arms ranges at Fort Harrison were generated using a model developed by the U.S. Army Environmental Hygiene Agency. The inputs to this procedure are the range location, weapons fired on the range, and the direction of fire (MT ARNG 1998). The model used the "equal annoyance principle" to locate the noise boundaries which established noise zones depending on compatibility with existing uses. Noise levels from the firing ranges were mapped in terms of one of three categories: Zone I: "compatible" (with existing uses); Zone II: "normally incompatible"; and Zone III: "highly annoying". Under this model, the outer noise Zone II boundary (the noise zone considered "normally incompatible") does not extend from the firing range to the veterans hospital (MT ARNG 1998). Firing ranges in the Limestone Hills are located at least four miles from sensitive receptors and are compatible with existing uses.

Mobile noise sources include helicopter training exercises and vehicular traffic. The helicopter training flights are essentially low-level training exercises that have been carried out at this facility since 1960. Because the Proposed Action does not affect helicopter training activities, noise generated from helicopter training is not addressed in this EA. Other mobile noise sources are vehicles, both personal and military. There have been no noise complaints registered at Fort Harrison in the previous several years regarding noise generated from vehicles.

In addition to stationery and mobile noise sources, a third noise source is from the military operational specialty qualification school. Primary noise for specialty schools in generated by

dismounted infantry training and land navigation training. The majority of the noise is generated by vehicles (tanks and Bradley Infantry Fighting Vehicles) traveling on established roads within the area. The maximum speed limits for all range roads and tank trails are 25 mph for wheeled vehicles and 15 mph for tracked vehicles unless otherwise designated. The vehicles stop on the established roads, and then soldiers dismount and move throughout the area while on exercise. Additional noise is generated by foot traffic and talking. Groups of soldiers typically ranging in size from two to eight move throughout the area practicing navigation, tactics, and maneuver. No live ammunition is used on the exercises. Background noise levels at Fort Harrison and the training area are similar to other rural areas (MT ARNG 1998).

4.4.2 Sensitive Receptors

Sensitive receptors are populations that are more susceptible to the effects of noise than is the general population. The nearest residence to the affected environment at Limestone Hills is within 0.5 miles of the study area boundary. However, sensitive receptors are greater than one mile from training activities that produce noise. The nearest residence to Fort Harrison is within 0.5 miles of the study area. The Veterans Administration Hospital, another sensitive receptor, is located in the center of the eastern portion of Fort Harrison. The MT ARNG has not received any complaints about noise during training activities at the Limestone Hills and Fort Harrison (Martinka 1998).

4.4.3 Noise Standards and Monitoring

The decibel (Db) is the physical unit commonly used to describe sound levels. Sound measurement is further refined by using an "A-weighted" decibel (dBA) scale that emphasizes the audio frequency response curve audible to the human ear. Thus, the dBA measurement more closely describes how a person perceives sound.

Scientific studies and social surveys that have been conducted to appraise community reaction to all types of environmental noise have found the day-night average sound level (L_{dn}) descriptor to be the best measure of annoyance. The L_{dn} describes the 24-hour or daily noise environment. To compute an L_{dn}, single noise events are measured using an A-weighted scale corrected for the number of events and the time of day. A 10-decibel penalty is added for noise

that occurs between 10 p.m. and 7 a.m. because nighttime noise is considered more annoying than noise occurring during daytime. The L_{dn} descriptor is accepted by federal agencies, including the U.S. Army, as a standard for estimating noise impact and establishing guidelines for comparable land uses.

U.S. Department of Housing and Urban Development (HUD) criteria regard areas with noise levels of 75 L_{dn} or greater as unacceptable living environments. The U.S. Department of Defense (DoD), EPA, and other agencies consider noise levels in excess of 65 L_{dn} as "normally unacceptable" for noise-sensitive land uses such as residences, schools, and hospitals. Houses located in areas between 65 and 75 L_{dn} may not qualify for federal mortgage insurance under HUD or Veterans Administration regulations without additional costs associated with installing noise attenuation measures.

Army Regulation 200-1 (Chapter 7) implements all federal laws concerning environmental noise from Army activities through the Installation Compatible Use Zone (ICUZ) program. The ICUZ program defines three noise zones. Table 3 presents a comparison of noise zones and weighting schemes.

TABLE 3
DESCRIPTION OF NOISE ZONES

Noise Zone	Percent Population Highly Annoyed	Transportation (dBA)	Small Arms (dBP)
I. Compatible	<15	<65 dBA	<87 dBP
II. Normally Incompatible	15-39	65-75 dBA	87-104 dBP
III. Incompatible	>39	>75 dBA	>104 dBP

dBA decibels, A-weighted: <less than (weighted for number of events and time of day)
dBP decibels, P-weighted: >greater than (weighted for frequency and time of discharge)
Source: MT ARNG 1998

The Army does not currently use the L_{dn} to evaluate the noise from small arms ranges. The linear peak sound level (dBP) is used to define these noise zones. The dBP weights all frequencies of the noise equally and provides the best correlation between the noise from small ranges and the percent of the population highly annoyed. The decision to describe small arms range noise with dBP was made by the U.S. Army Environmental Hygiene Agency in 1982 (MT ARNG 1998).

4.4.4 Land Use Compatibility

Environmental noise from Army activities is monitored by the ICUZ program, which defines three noise zones (see Table 3). The Army uses these compatibility zones for land use planning to prevent conflicts with noise-sensitive land uses such as residential housing and hospitals. Land uses such as commercial, industrial, and agricultural (except livestock) are compatible with most noise environments.

The only sensitive receptor near either the Limestone Hills or Fort Harrison training areas is the Veterans Administration Hospital. There are no existing noise constraints or issues regarding any of the MT ARNG training activities at Fort Harrison. Potential future noise issues could arise if new residences are constructed near Fort Harrison or the Limestone Hills.

4.5 Geology and Soils

Geological resources include physical surface and subsurface features of the Earth such as the physiography, geology, soils, and seismic nature of an area.

4.5.1 Topographic Conditions

The Limestone Hills is a series of north-south trending limestone ridges on the western boundary of an intermontaine basin known as the Townsend Valley. Elevations in the Limestone Hills range from about 3,900 feet (1,300 meters) AMSL to about 5,400 feet (1,800 meters) AMSL (Figure 3A). The Limestone Hills are at the western edge of the Townsend Valley, a broad intermontane basin in west-central Montana extending from Toston to Canyon Ferry. The Missouri River enters the area near Townsend and flows northward through the northern half of the area (Figure 1). The Townsend Valley is bounded by the Big Belt Mountains on the west and the Elkhorn Mountains on the west and is restricted at the north by the Spokane Hills. The Limestone Hills protrude eastward into the valley beyond the general front of the Elkhorn Mountains. North of the Limestone Hills, the benchlands consist mostly of riverward-sloping fans formed by streams flowing out of the Elkhorn Mountains. South of the Limestone Hills, the benchlands are the remnants of a pediment that has been dissected by tributaries of Crow Creek.

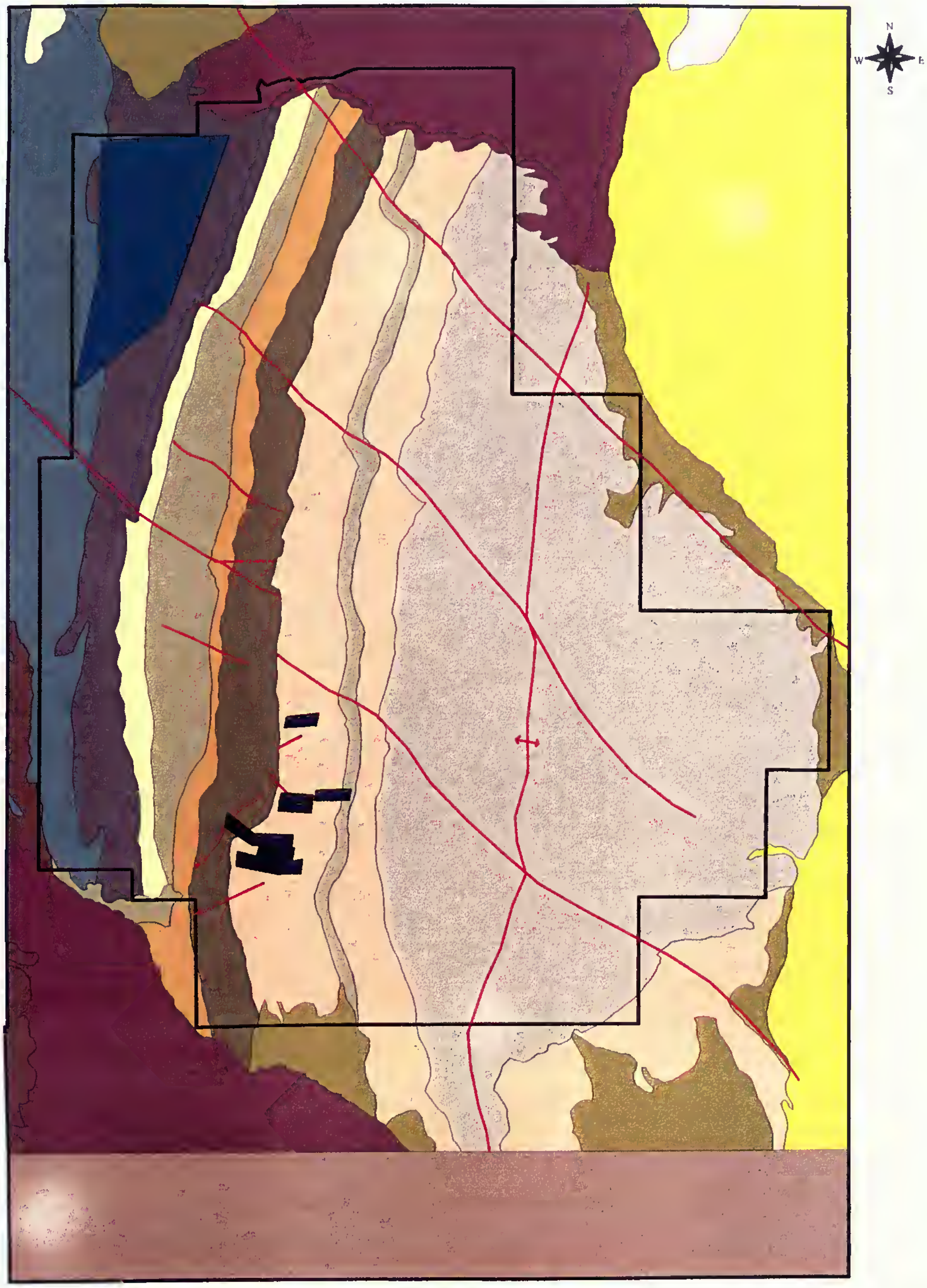
Fort Harrison is located on the west edge of the Helena Valley, a northwest-trending, oval-shaped basin covering about 875 square miles. The valley is bounded on the west by the Scratchgravel Hills, on the southwest by the main range of the Rocky Mountains, on the south by the Elkhorn Mountains and Boulder batholith, the Big Belt Mountains to the north, and the Spokane Bench to the east. The western part of the valley is gently sloping, while the eastern portion of the valley consists of low rolling hills. Mount Helena, on the southern edge of the City of Helena, rises to approximately 5,460 feet AMSL. Elevations at Fort Harrison range from 3,950 feet AMSL in the southeast to 4,818 feet near the southwest corner.

4.5.2 Geology

The Limestone Hills area is an eroded steeply dipping west limb of an anticline extending from Townsend south toward Crow Creek (Figure 5A). Surface geology of the Limestone Hills includes the following sedimentary rocks (from oldest to youngest, east to west): Precambrian shales; Paleozoic dolomites; shale, and limestones; Pleistocene terraces and pediments and recent alluvium (Figure 5A). The prominent topographic feature of the Limestone Hills is composed of Mississipian Mission Canyon and Lodgepole Limestone Formations. The Lodgepole and Mission Canyon Formations are thin-bedded fossiliferous limestones in the area and comprise the Madison group of early Mississippian age (Klepper and others 1971). Tertiary diorite intrusions are present between the Jefferson and Lodgepole limestones on the east flank of the Limestone Hills (Figure 5A).

The Limestone Hills contain several northwest-trending normal faults with horizontal displacement up to 1,000 feet (Figure 5A). Several large faults transect the area, the largest of which (the Indian Creek fault) extends for about 5 miles northwest from the east edge of the Limestone Hills to Indian Creek (Lorenz and McMurtrey 1956).

The Fort Harrison area is within the Helena Valley, which is a topographic and structural intermontane basin surrounded and underlain by folded and fractured sedimentary, metamorphic, and igneous rocks of Precambrian to Cretaceous age. Quaternary valley fill forms a gently sloping alluvial plain in the Helena Valley that measures about 8 miles square. The alluvial plain is bounded by pediments and alluvial fans that descend from the hills located to the south, west, and north of the valley. A line of low, rolling hills composed of poorly consolidated fine-grained



See APPENDIX A for data sources

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 5A
ENVIRONMENTAL ASSESSMENT
GEOLOGY

Tetra Tech EM Inc.

sediments forms the Spokane Bench on the east. Pleistocene glaciation also affected the Helena Valley through the periodic deposition of silt from glacial lake flooding over coarser grained stream deposits from alpine glacial outwash.

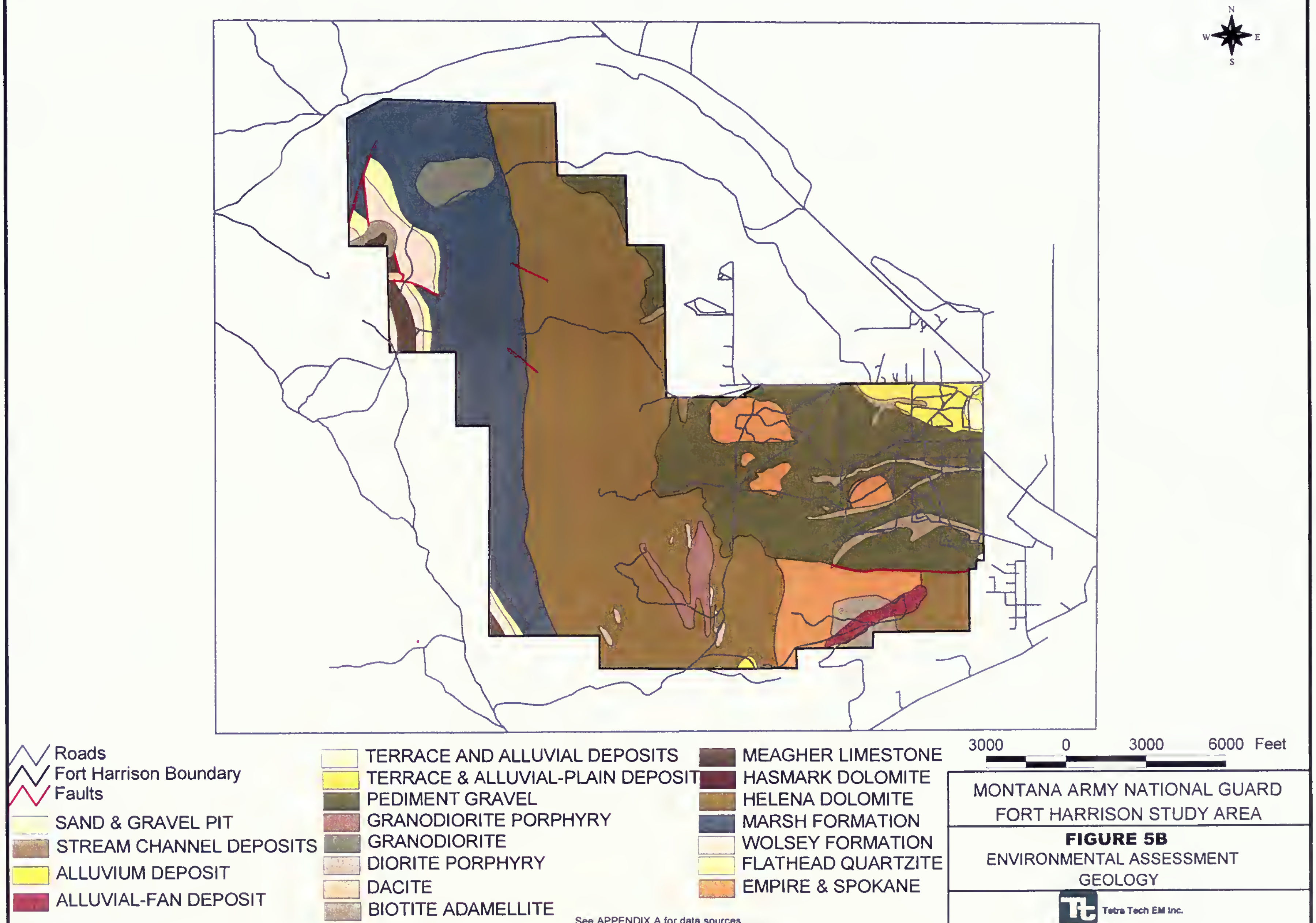
Most of the Fort Harrison facility is underlain by pre-Tertiary bedrock. Surficial geology at Fort Harrison also includes Quaternary Alluvium and Quaternary-Tertiary pediments at the east portion of the base in the vicinity of the cantonment area (Figure 5B). Alluvial deposits exposed at the northeast corner of the Fort Harrison facility are a stratified complex of cobbles and gravel with 30 to 70 percent intercalated silt and clay. The remaining area on the lower slopes of the facility is underlain by pediments and terrace deposits composed of eroded bedrock and gravels. Most of the base west and south of the hospital is directly underlain by folded and fractured Precambrian sediments (Helena Dolomite and Marsh Formation). Tertiary granitic bedrock is exposed in the southeastern part of Fort Harrison (Figure 5B).

4.5.3 Seismic Conditions and Fault Features

Earthquakes are not common in the Townsend Valley; however, large earthquakes were recorded in 1925 and 1935 near Lombard and Helena, respectively (Lorenz and McMurtrey 1956). The 1925 earthquake displaced rock masses from steep slopes and cliffs within 20 miles of the epicenter, which would include the Limestone Hills.

Fort Harrison lies within an earthquake-prone region. The Uniform Building Code rates Fort Harrison as Zone 3 on its seismic zonation map (MT ARNG 1998). In this zone, earthquakes with a Modified Mercalli intensity of VIII or greater (5.5 or higher on the Richter Scale) are anticipated which means that poorly designed buildings would suffer major damage and buildings designed for earthquake motion would have only slight damage. Several hundred earthquakes have been felt in the Helena area since records were first kept in 1864. Most of the earthquakes have been of weak to moderate intensity. Several strong earthquakes occurred in the region between 1925 and 1959, causing property damage in Helena.

The seismically active Bald Butte Fault transects the west and south edge of the Helena Valley near the northeast corner of the base. Vertical displacement along the fault varies from about 650 feet to more than 14,400 feet. Recent movement of the fault is believed to be horizontal



See APPENDIX A for data sources

MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA

FIGURE 5B
ENVIRONMENTAL ASSESSMENT
GEOLOGY

Tetra Tech EM Inc.

rather than vertical (Briar and Madison 1992). Associated faulting is present in the western portion of the study area (Figure 5B).

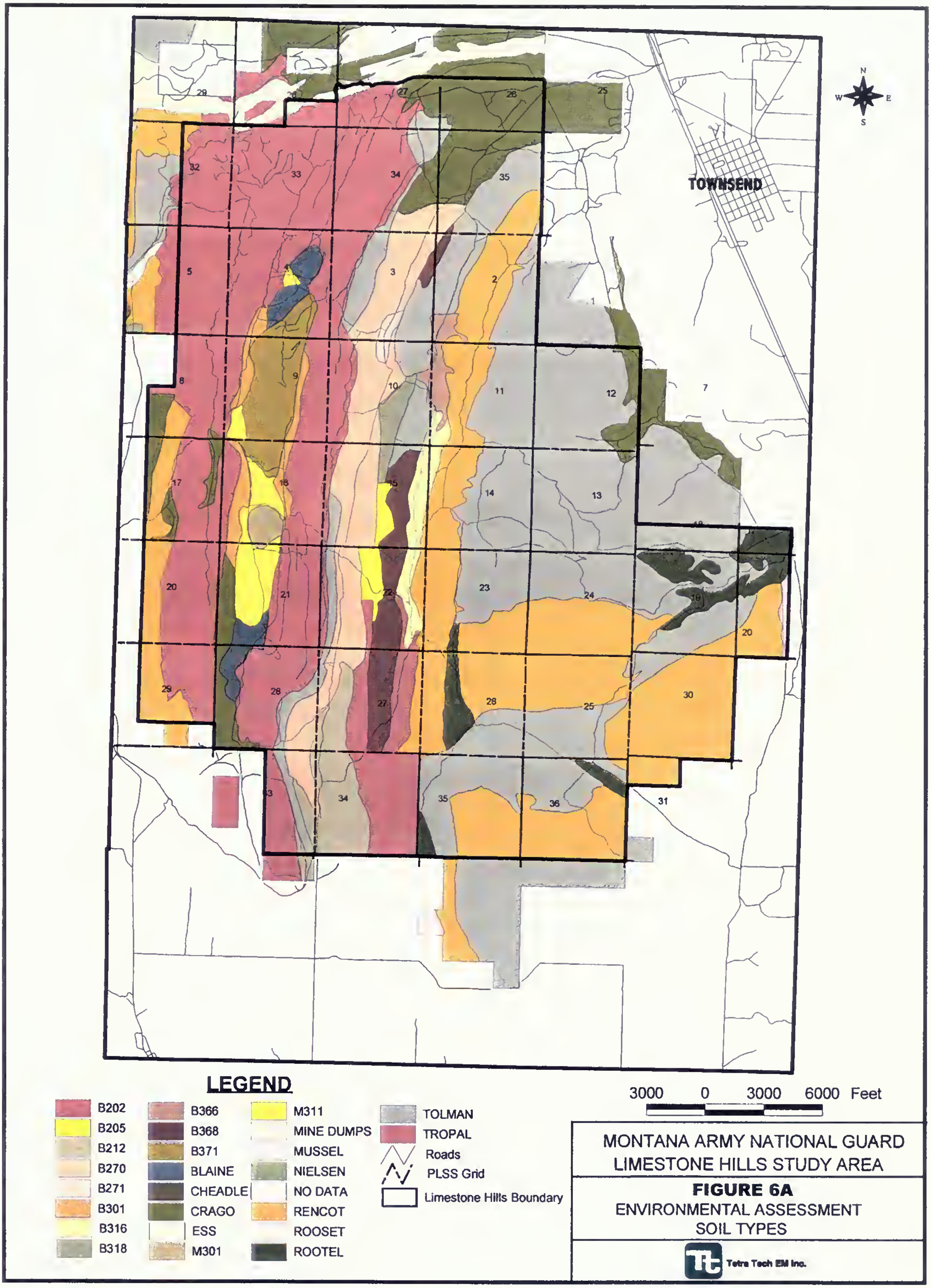
4.5.4 Soil Types

The Limestone Hills training area has primarily shallow, well-drained soils of the Tropal-Rencot-Tolman association (Figure 6A). All soils in these series are weathered from limestone or argillite bedrock, have a severe erosion hazard, moderate permeability, and are used for range land. Tropal gravely loams form in strongly calcareous gravely to very gravely loam weathered from hard limestone rock. Slopes range from 15 to 60 percent. Limestone bedrock is at a depth of about 19 inches. Rencot Channery loams are formed from weathered hard argillite or sandstone (Figure 6A). The Tolman series formed in calcareous weathered argillite. Slopes range from 10 to 35 percent. Argillite bedrock is at a depth of about 18 inches (U.S. Department of Agriculture [USDA] 1977)

Soils in the Fort Harrison area formed on alluvium and bedrock. The pattern of soils is complex because of different parent material, drainage patterns, and slopes. Soils encountered in the training and storage areas include the Crago-Musselshell Complex, Geohrock-Tolman-Channery Loams, and Hauz-Tolman Channery Loams (Figure 6B). Soils at Fort Harrison have a moderately low runoff potential. The permeability is moderate (0.6 to 2.0 inches per hour) to a depth of about 20 inches and moderately rapid (2.0 to 6.0 inches per hour) at greater depths. Rate of water transmission through the soil is moderate. The shrink-swell potential is low. The hazard of wind erosion is slight. The hazard of water erosion ranges from slight where the slopes are gentle to moderate where the slopes are steeper (USDA 1977).

4.5.5 Agricultural Land

The entire Limestone Hills area is categorized as range land by soil type and is not prime farmland (USDA 1977). Considerable irrigated prime farmland lies adjacent to the Fort Harrison Complex; however, the affected environment at Fort Harrison is not considered a prime agricultural area (USDA 1998). The land in the firing range area is not tillable but had been used for grazing before it became federally owned.


TOWNSEND
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BLAINE
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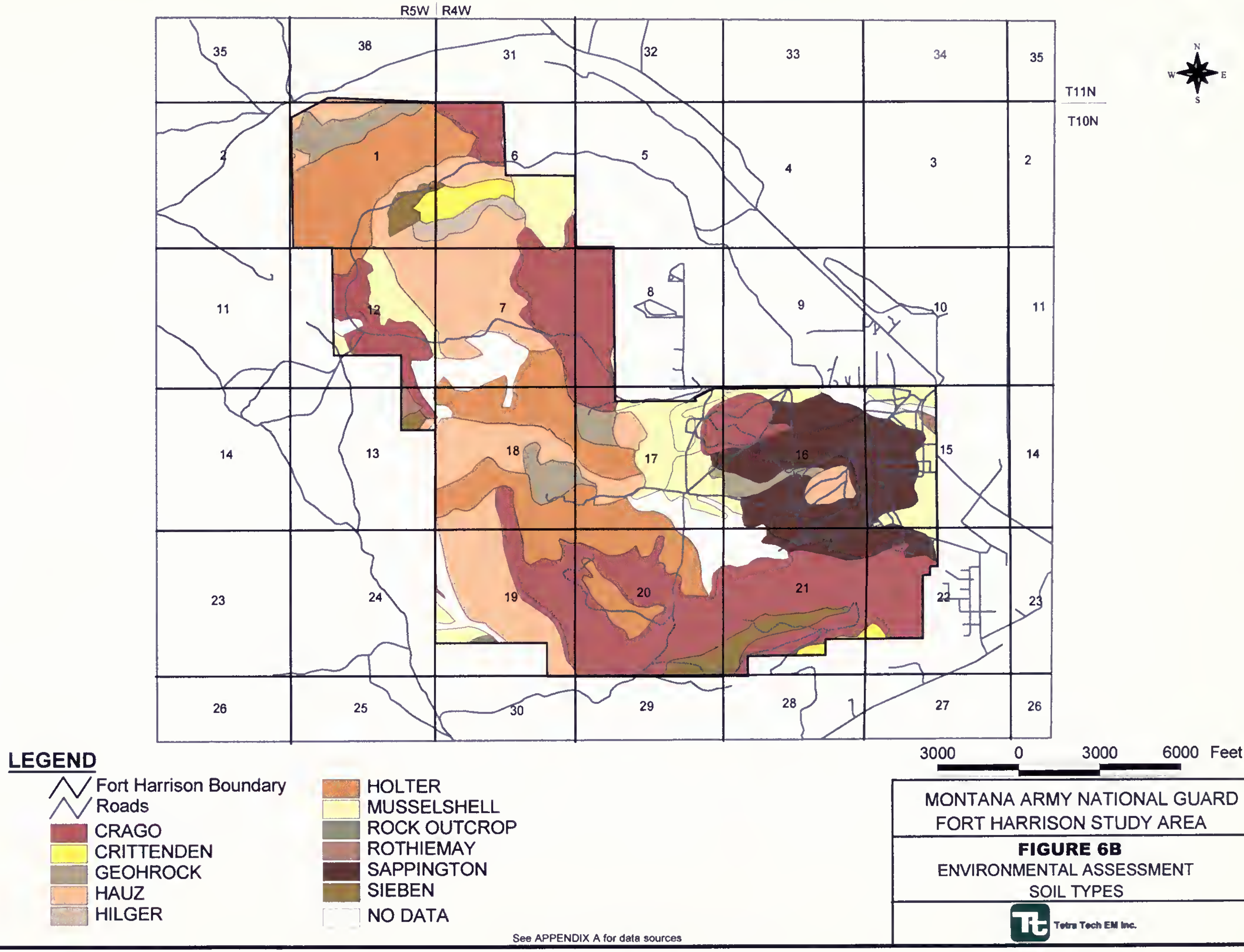
ESS
M301
M311
MINE DUMPS
MUSSEL
NIELSEN
NO DATA
RENCOT
ROOSET
ROOTEL
TOLMAN
TROPAL
Roads
PLSS Grid
Limestone Hills Boundary
3000 0 3000 6000 Feet
MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA
FIGURE 6A
ENVIRONMENTAL ASSESSMENT
SOIL TYPES
Tetra Tech EM Inc.

4.5.6 Mining Resources

Mining resources in the Limestone Hills have included precious metals, gravel, and limestone. A few small deposits of gold, copper, and manganese have been found in the Limestone Hills, but none has been of economic importance. The principal prospects are replacement bodies in Paleozoic limestones and dolomites resulting from Tertiary intrusions forming veins that have been prospected with shafts up to 100 feet deep in many places (mine sites are shown on Figure 4A). Placer gold has been mined sporadically since 1870 from bench gravel and valley-bottom alluvium at several places along and near lower Indian Creek (Klepper and others 1971). Mining camps with the evocative names Hog-Em, Cheat-Em, and Rob-Em formed near the Indian Creek placer deposits (Davis and others 1980). About 10,050 ounces of gold were recovered from a dredge operation in the 1940s. The placer gold was believed to be derived from the Diamond Hill area and other lode deposits in the Elkhorn Mountains west of the Limestone Hills (Freeman and others 1958) Limestone was quarried as building stone in the southern Limestone Hills between 1928 and 1937. During the 1940s, 6,300 tons of quartzite was quarried at one locality in the Limestone Hills for use at the Trident, Montana, cement plant.

Most recently, Continental Lime, Incorporated has operated a limestone quarry and lime plant in the northwest corner of the study area (Figure 5A). The mine exploits the Mission Canyon Limestone Formation which outcrops as a north-south trending ridge throughout the length of the study area (Figure 5A). Because there is a risk of encountering UXO hazard south of its existing active mine area, the BLM has permitted Continental Lime, Inc. to mine the Mission Canyon Limestone only within current mine boundaries shown on Figure 5A. The UXO hazard is further described in Section 4.12.3.

The plutonic rocks in the vicinity of Fort Harrison have been mineralized and contain veins of gold. Erosion of these rocks has released gold to alluvium of modern drainages (Briar and Madison 1992). There are several dozen prospects within the Fort Harrison area, including eight mine shafts (Figure 4B). Scattered coal deposits are located about 10 miles to the west of Fort Harrison. These deposits are not commercially mined (Briar and Madison 1992). No active gravel or fill operations operate within a mile of Fort Harrison.



MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA

FIGURE 6B
ENVIRONMENTAL ASSESSMENT
SOIL TYPES

Tetra Tech EM Inc.

4.6 Water Resources

This section describes surface waters and groundwater resources in the affected environment. Wetlands are described in Section 4.7.4. Natural and human-induced factors determine the quality and quantity of water resources, and are described as relevant to this evaluation.

4.6.1 Hydrology

Surface water and groundwater in both the Helena and Townsend Valleys tend to flow toward the Missouri River. The Missouri River and its tributaries drain all the area within the Townsend Valley, including the Limestone Hills. Eleven perennial streams flow through the Townsend Valley to the Missouri River (Lorenz and McMurtrey 1956). Groundwater in the Townsend Valley is derived primarily from unconsolidated Quaternary and Tertiary deposits in the valley bottom. Fort Harrison is located at the southwest boundary of the Helena Valley, an intermontane basin that receives surface water from four principal streams: the Prickly Pear, Tenmile, Sevenmile, and Silver Creeks. Groundwater in the Helena area supplies drinking water for about 50 percent of the residents and is withdrawn from the Helena Valley alluvial aquifer and several fractured bedrock systems on the edge of the valley. Surface water from Tenmile Creek and the Missouri River supply most of the remaining residents with drinking water (Drake 1998).

4.6.1.1 Surface Water

The Limestone Hills are transected by one perennial stream (Indian Creek) and several ephemeral drainages (Figure 3A). Indian Creek originates in the Elkhorn Mountains west of the Limestone Hills, flows through the north end of the affected environment, and discharges to the Missouri River (WESTECH 1997). Most of the water conveyed by Indian Creek is lost to underlying gravel (Lorenz and McMurtrey 1956). Ephemeral drainages in the Limestone Hills are limited to low areas between limestone ridge outcrops. Water collected in these drainages tends to infiltrate or evaporate and does not contribute to the Missouri River system as surface water discharge.

Fort Harrison is located in the Tenmile Creek watershed and is transected by two intermittent drainages (Granite Creek and Cherry Creek) and one perennial stream (Blue Cloud Creek), as

shown in Figure 3B. Fort Harrison is bounded on the northeast by the small perennial Sevenmile Creek, which flows into Tenmile Creek; and on the south by Tenmile Creek, located near the southern boundary of the base (Figure 4B). Granite Creek transects the northwest portion of the affected environment and flows northeast, off the base to Sevenmile Creek. Cherry Creek flows in an easterly direction through the north central portion of the base and into a canal system east of the base, where it is completely diverted for irrigation (WESTECH 1997). Blue Cloud Creek is a perennial stream that flows in a southeast direction, transecting the southwest corner of the base and joins Tenmile Creek near the south boundary of the base. Stormwater is managed in the southeast portion of the base (in the vicinity of existing structures) and directed off site on the south and east boundaries of the base (Peccia 1997). Surface water flows are typically the greatest in the spring during snowmelt. Surface water runoff during this time tends to pond in shallow depressions at the southeast portion of the base, creating muddy areas. There are currently no on-site detention basins to reduce peak runoff (Peccia 1997).

4.6.1.2 Groundwater

Groundwater resources underlying the Limestone Hills study area are not well defined. The Limestone Hills area has no known aquifer that yields potable water at an adequate rate for domestic use. Geologic formations that outcrop and underlie the study area that are known to be aquifers elsewhere in western Montana include the Madison Group (Mission Canyon and Lodgepole formations in Figure 5A) and recent alluvium (NRIS 1997). Five groundwater wells are recorded in the study area: two older, shallow wells located in the vicinity of intermittent streambeds and used for stock watering; and three deep (greater than 100 feet) wells (Montana Bureau of Mines and Geology [MBMG] 1998).

Fort Harrison overlies two groundwater systems: the Helena Valley Aquifer in the northeast part of the base, and a bedrock aquifer system under the west and southwest part of the base. The Helena Valley Aquifer is the sole source of domestic water supply for about half the residents of the Helena area (Drake 1998). Quaternary valley fill in the Helena Valley forms a gently sloping alluvial plain that is recharged principally by surface water from Prickly Pear, Tenmile, Sevenmile, and Silver Creeks, and by irrigation canals. Additional recharge is provided by groundwater from bedrock aquifers that ring the Helena Valley. The Helena Valley aquifer is composed of coarse-grained, near-surface deposits that allow rapid infiltration of surface water

and contaminants (Briar and Madison 1992). This aquifer system is most susceptible to potential contamination where the hydraulic gradient is downward and vertical permeability allows downward flow, as in the Fort Harrison area. Groundwater underlying Fort Harrison is also contained in fractured sedimentary, metamorphic, and igneous bedrock that outcrops at the edges of Helena Valley alluvial deposits (Figure 5B). Groundwater yields adequate domestic use supply from unpredictable locations in the fractured bedrock system. Well logs indicate that depth to groundwater ranges from 30 to 200 feet below ground surface in the vicinity of Fort Harrison (MBMG 1998).

There are 27 recorded wells in the Fort Harrison study area, located primarily in the eastern portion and the northwestern corner. Wells in the Granite Creek drainage average about 50 feet deep with water levels from 12 to 37 feet below ground surface (MBMG 1998). Wells in the eastern portion near and in the cantonment area are typically greater than 100 feet deep. About 60 percent of the wells in the study area were drilled for domestic use. Other uses include irrigation, groundwater monitoring (2 wells) and stock watering (MBMG 1998). MT ARNG and the Veterans Administration Hospital use well water for irrigation but are on the city water system for drinking water.

4.6.2 Water Quality and Pollution Sources

Groundwater quality in the Limestone Hills is unknown with the exception of MT ARNG well water, which is suitable for drinking after treatment for coliform. Groundwater in the bedrock aquifer systems and the Helena Valley fill system is of good quality, suitable for drinking (WQPD 1998). The valley fill aquifer is a calcium bicarbonate type. Dissolved solids concentrations range from 85 milligrams per liter (mg/L) to 1,250 mg/L and have a median value of 286 mg/L (Briar and Madison 1992). The U.S. Environmental Protection Agency Secondary Drinking Water Regulations specify a maximum concentration limit of 500 mg/L for dissolved solids in public drinking water supplies (EPA 1991)

The Helena Valley fill aquifer system is susceptible to potential contamination from surface or near-surface sources because its coarse-grained character does not impede infiltration of contaminants. The valley fill aquifer is currently affected by historical waste disposal practices

such as unlined landfills, storm water discharges, septic systems, and sewage lagoons (WQPD 1998).

Surface water quality in the affected environment is unknown. Most water bodies flow intermittently and, as such, do not support aquatic life throughout most of the year.

4.6.3 Floodplain Areas

The affected environment does not fall within the 100-year floodplain of any major stream (Montana Department of Natural Resources and Conservation 1998).

4.6.4 Water Resource Districts

The Limestone Hills area does not fall within a water resource district. Fort Harrison is within the Lewis and Clark County Water Quality Protection District (WQPD), a nonregulatory government agency that monitors and protects surface and groundwater quality in watersheds discharging to the Helena Valley. WQPD is currently assessing the extent and quality of groundwater in bedrock aquifer systems that discharge to the Helena Valley Aquifer, including bedrock underlying the Fort Harrison study area (Drake 1998). Fort Harrison does not have a representative on the Tenmile Creek watershed protection group of adjacent landowners and stakeholders.

4.7 BIOLOGICAL RESOURCES

This section describes the vegetation, wildlife, sensitive species, and wetlands in the Limestone Hills and Fort Harrison study areas.

4.7.1 Vegetation

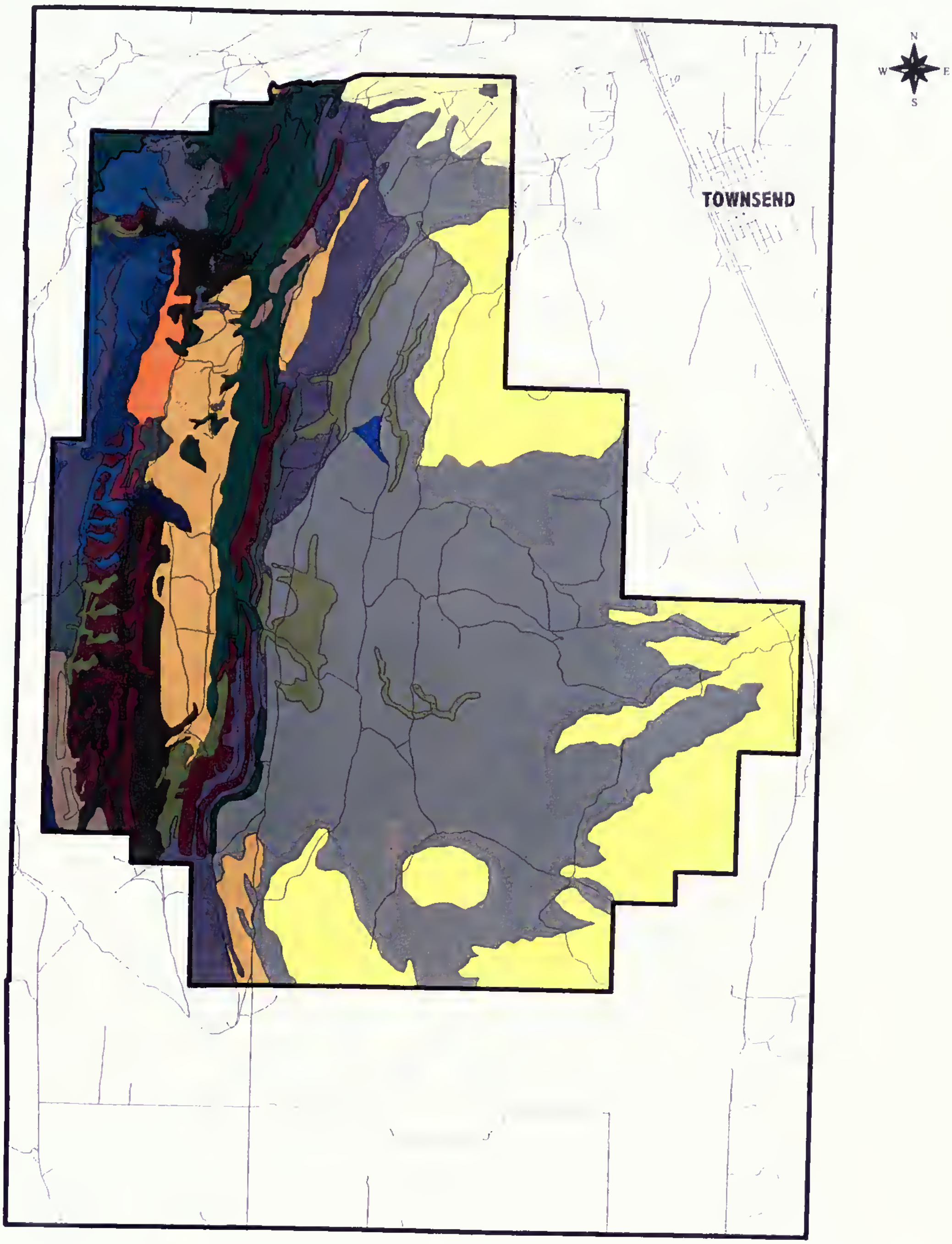
The gentle to steep rolling hills of the east part of the Limestone Hills (east of Old Woman's Grave Road) are vegetated by native bunchgrass, big sagebrush, Rocky Mountain juniper/big sagebrush, and similar xeric species (Figure 7A). Some areas had been burned, and post-fire vegetation is primarily bunchgrass and native forbs. Deciduous trees (cottonwood and aspen) are present near Old Woman's Grave Road, where springs create short intermittent drainages (Figure

7A). The west part of the Limestone Hills is characterized three prominent north-south trending features that include two steep rocky ridges (composed of limestone outcrops), divided by a narrow dry valley. The ridges support limber pine, Rocky Mountain juniper, big sagebrush, black sagebrush, and curlleaf mountain mahogany. Several portions of this area have been burned, largely eradicating Rocky Mountain juniper, curlleaf mountain mahogany, and sagebrush, leaving bunchgrass and associated forbs (Tetra Tech Inc, [Tetra Tech] 1998).

Vegetation in most of the affected area of Fort Harrison consists of native bunchgrass habitats, dominated by species such as bluebunch wheatgrass, Idaho fescue, needle-and-thread, and prairie junegrass (Figure 7B). Ephemeral drainages support western wheatgrass, Kentucky bluegrass, and mesic shrubs such as rose and western snowberry. Big sagebrush is sometimes present. Some areas are infested with introduced noxious weeds including spotted knapweed, leafy spurge, dalmation toadflax, and Canada thistle (Tetra Tech 1998). Middle to upper elevations, particularly in the northern half of the base, support a mixture of coniferous species, including Rocky Mountain juniper, ponderosa pine, limber pine, and Douglas fir. Douglas fir is the climax tree species at upper elevations on north and west slopes. Aspen stands, rose, and chokecherry are present on the streambanks of Granite Creek. Rocky Mountain juniper and large mature cottonwoods are present as streambank vegetation on Cherry Creek. Blue Cloud Creek streambank vegetation consists of aspen, willow, and mesic shrubs (WESTECH 1997).

4.7.2 Sensitive Species

The Endangered Species Act (ESA) requires that any action authorized by a federal agency must not jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of designated critical habitat of such species. A listed species, provided protection under the ESA is so designated because of danger of its extinction. Information provided by the Montana Natural Heritage Program (MNHP 1998) indicates that no species listed or proposed for listing as threatened or endangered, other than migrant bald eagles, are likely to occur within the Fort Harrison or Limestone Hills study areas. During reconnaissance for a biological survey of vegetation, reptiles, amphibians, and bats, the MT ARNG determined that no sensitive, rare, or threatened plant species were found in the affected environment (Tetra Tech 1998).



LEGEND

Roads
Limestone Hills Boundary
Prairie Grassland
Grassland/Sagebrush*
Grassland/Juniper*
Foothills Grassland/Mountain Mahogany*
Black Sagebrush
Black Sagebrush/Juniper*
Big Sagebrush/Juniper*
Rocky Mountain Juniper
Juniper/Black Sagebrush*
Juniper/Mountain Mahogany*
Mountain Mahogany
Mountain Mahogany/Black Sagebrush*
Limber Pine Forest - Savannah
Limber Pine Forest-Savannah/Prairie Grassland*
Limber Pine Forest -Savannah/Foothills Grassland
Limber Pine Forest-Savannah/Black Sagebrush*
Limber Pine Forest-Savannah/Big Sagebrush*
Limber Pine Forest-Savannah/Douglas -Fir Forest*
Douglas - Fir Forest
Douglas-Fir Forest/Limber Pine Forest-Savannah*
Tame Pasture
Deciduous Forest Drainage Bottom
Deciduous Forest Drainage Bottom
Disturbed

*Dominant Vegetation Type named first

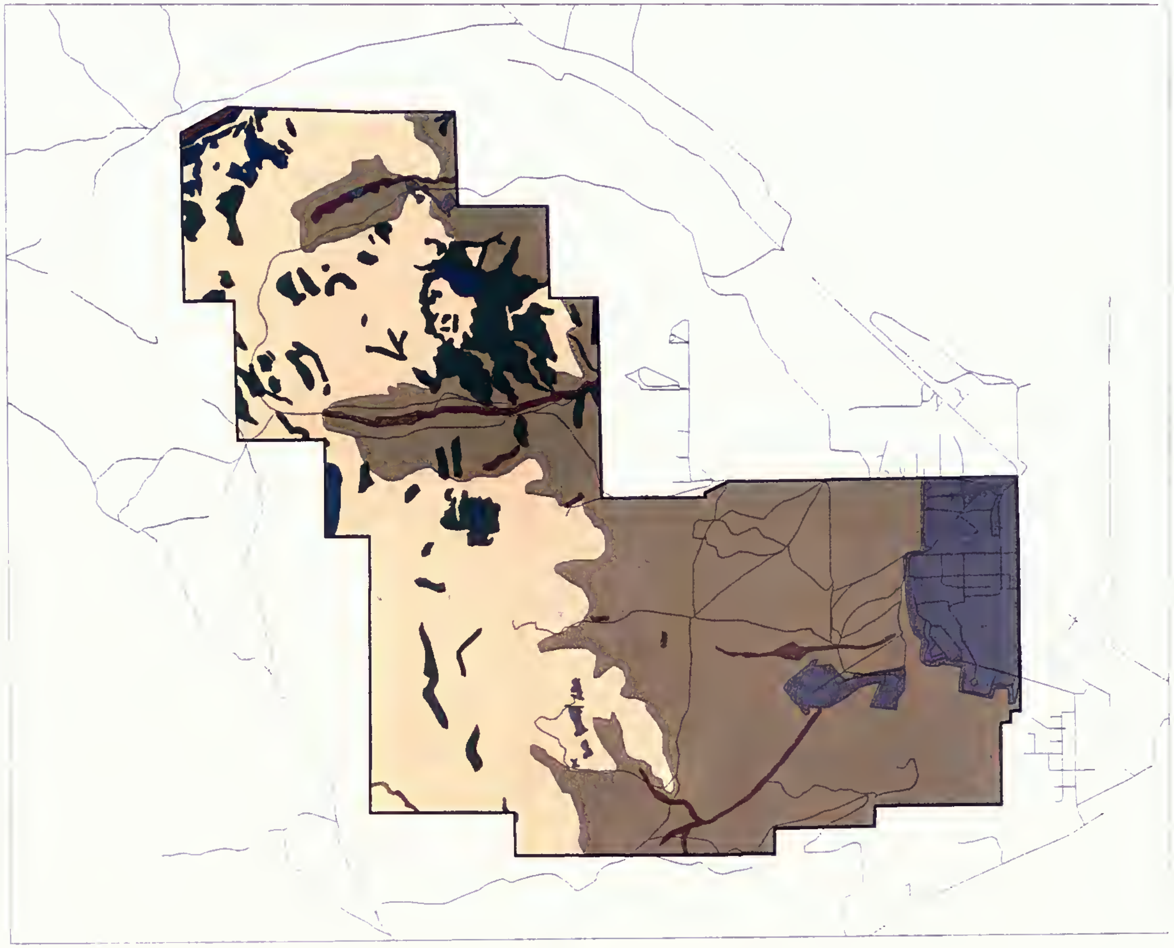
3000 0 3000 6000 Feet

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 7A
ENVIRONMENTAL ASSESSMENT
VEGETATION

See APPENDIX A for data sources

Tetra Tech EM Inc.



LEGEND

Fort Harrison Boundary
Roads
Prairie Grassland
Foothills Grassland
Big Sagebrush/Basin Wildrye
Limber Pine Forest - Savannah
Douglas - Fir Forest
Deciduous Forest Drainage Bottom
Deciduous Forest and Shrub Drainage Bottom
Shrub Drainage Bottom
Herbaceous Drainage Bottom
Herbaceous and Shrub Drainage Bottom
Agricultural Land
Disturbed Vegetation

See APPENDIX A for data sources

3000 0 3000 6000 Feet

MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA

FIGURE 7B
ENVIRONMENTAL ASSESSMENT
VEGETATION

Tetra Tech EM Inc.

Two plants of special concern have been identified in the Limestone Hills study area: the lesser rushy milkvetch and Sword townsendia (Tetra Tech 1998). The lesser rushy milkvetch is a fescue bunchgrass found primarily on lower slopes and toeslopes of limestone ridges in the northern half of the Limestone Hills study area, particullarly in sagebrishand juniper-dominated communities. Populations are healthy and capable of withstanding moderately heavy grazing pressure (Tetra Tech 1998). Sword townsendia is a forb that occurs on open, rocky, limestone-derived soils of slopes and windswept ridgetops in valley and foothill zones. Sword townsendia was observed during field reconnaissance within and adjacent to the mining permit area of Continental Lime, Inc (Tetra Tech 1998). Sword townsendia is considered vary rare globally but has healthy local populations. Its status is on the "watch" list of "limited distribution species" but is considered too abundant within its area to be sensitive (Tetra Tech 1998). It is not currently being tracked by the Montana National Heritage Program (MNHP 1998).

The Fort Harrison area includes two plants of special concern. The MNHP database identified the long-styled thistle, located in an area within two miles west of the study area. This plant is generally found in open grassland surrounded by forest, on grazed pasture, or in meadow land. The long-styled thistle was not identified in the study area during a vegetation reconnaissance (Tetra Tech 1998). The lesser rushy milkvetch is a fescue bunchgrass that was identified in the Fort Harrison study area during field reconnaissance (Tetra Tech 1998). The lesser rushy milkvetch is widely distributed throughout the Fort Harrison study area, particularly in grassland. Populations are healthy and capable of withstanding moderately heavy grazing pressure. Currently, the lesser rushy milkvetch is on the BLM "watch" list indicating it is "suspected to be imperiled and documented on BLM lands, or it needs further study or for other reasons" (WESTECH 1998).

The MNHP database identified four animal species of special concern within 8 miles of the Fort Harrison study area (the flammulated owl, westslope cutthrout trout, gray wolf, and the lesser rushy milkvetch). Habitat for the flammulated owl is believed to be mature old-growth ponderosa pine forest with a Douglas fir understory (MNHP 1998). Nesting is in woodpecker holes or natural cavities. No habitat for the owl is known to exist in the study area. Cutthrout trout habitat is perennial streams or other bodies of water. Streams in the Fort Harrison area are intermittent and do not provide habitat for the cutthroat trout. The gray wolf is federally listed as endangered. Wolves have been documented approximately 15 miles west of Fort Harrison (MT

ARNG 1998). No sighting has been reported within the immediate vicinity of Fort Harrison (MT ARNG 1998). The potential occurrence of threatened and endangered reptiles, amphibians, and bats in the Fort Harrison and Limestone Hills training areas is considered unlikely (WESTECH 1997).

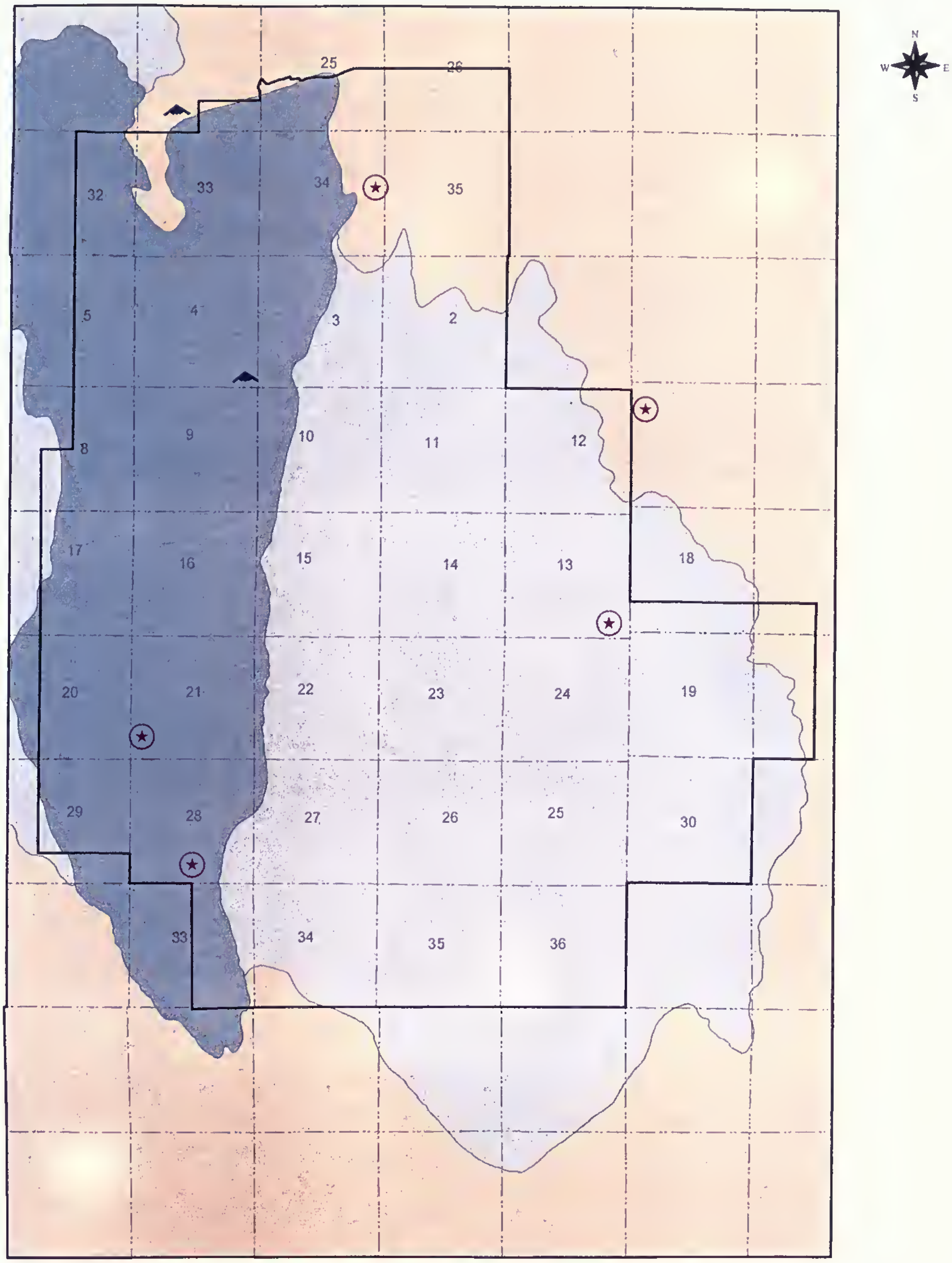
The Limestone Hills potentially support most of the 14 species of bats found in Montana that are not listed as threatened and endangered. No bats have been sighted in the Fort Harrison study area; however, mine shafts, portals, and other facilities in the Fort Harrison study area have been identified as potential bat habitat (WESTECH 1997).

4.7.3 Wildlife

The affected environments of the Fort Harrison area and the Limestone Hills serve as wildlife habitat for big game, small mammals, birds, and reptiles (Figures 8A and 8B). Upper elevations in both study areas are used for elk and mule deer winter range (Carlsen 1998). A list of all birds, mammals, and reptiles recorded by direct observation or by evidence during a 1997 reconnaissance is provided in Appendix C (WESTECH 1997). No amphibians are recorded in either study area. Twenty-eight species of birds are recorded in the Limestone Hills training area; 30 bird species are recorded in the Fort Harrison area, with 11 species in common between the two areas. All but one of the various species recorded in the two areas would be expected to occur in both areas (the green-tailed towhee occurs in the Limestone Hills but would not be expected to occur in the Fort Harrison area [WESTECH 1997]). A total of 20 species of mammals is recorded in both study areas. All species were considered common and might readily occur in the habitats of the two training areas. Of these species, the black-tailed prairie dog is not present in the Limestone Hills. No reptiles are on record in the Fort Harrison study area, while three species of snakes are recorded in the Limestone Hills area. No lizards are recorded in either area (WESTECH 1997).

4.7.4 Wetlands

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under similar circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands on MT



3000 0 3000 6000 Feet

LEGEND

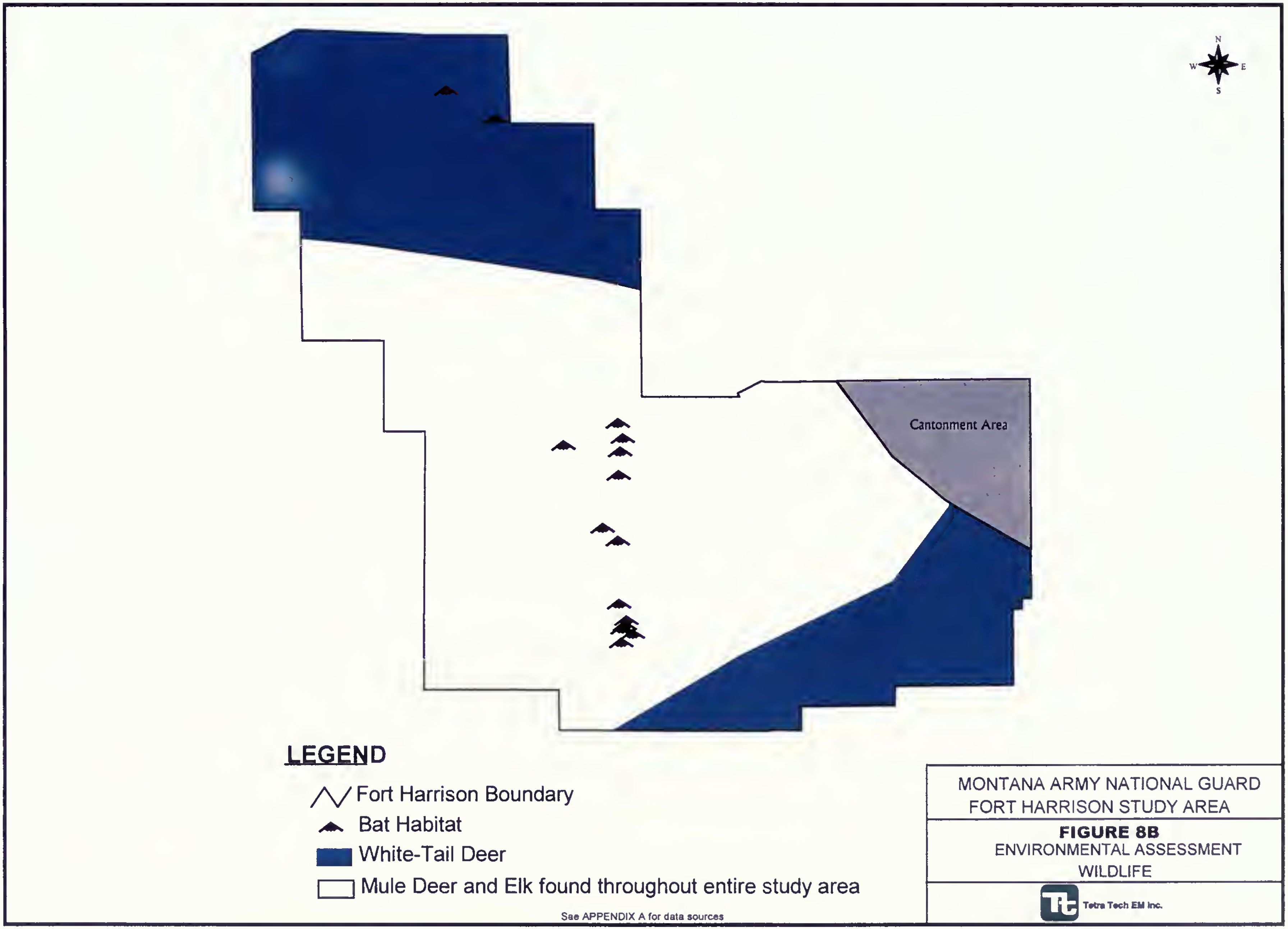
Bats
Snakes
Limestone Hills Boundary
MULE DEER
MULE DEER -CRITICAL HABITAT
NO DATA

See APPENDIX A for data sources

MONTANA ARMY NATIONAL GUARD
LIMESTONE HILLS STUDY AREA

FIGURE 8A
ENVIRONMENTAL ASSESSMENT
WILDLIFE

Tetra Tech EM Inc.



MONTANA ARMY NATIONAL GUARD
FORT HARRISON STUDY AREA

FIGURE 8B
ENVIRONMENTAL ASSESSMENT
WILDLIFE

Tetra Tech EM Inc.

ARNG areas are delineated based on the presence of three parameters: hydrophytic vegetation, wetland hydrology, and hydric soils (U.S. Army Corps of Engineers 1987). Wetlands are diverse ecosystems that provide ecological benefits by supporting commercial fisheries, controlling floods, filtering wastes from water, and serving as recreation areas. They also provide habitat for many plant and animal species, including economically valuable waterfowl and one-third of the nation's endangered species.

Limited wetland areas have been delineated in both the Limestone Hills and Fort Harrison study areas (Figures 3A and 3B). Approximately 4.3 acres of potential wetland areas have been identified in the Limestone Hills, primarily associated with the wetland fringe along drainageways (Tetra Tech 1998b). In the Fort Harrison study area, fringe wetlands are associated with some of the perennial stretches of Granite Creek, Cherry Creek, and Blue Cloud Creek. Approximately 2.3 acres of jurisdictional wetlands have been identified at Fort Harrison (Tetra Tech 1998b). Many areas along sections of the ephemeral and intermittent drainages support more robust plant communities but, because they lack one or more of the wetland diagnostic criteria (such as hydric soils or hydrophytic vegetation), are considered riparian areas.

4.7.5 Special Habitat Areas

Wildlife habitats in the Limestone Hills are bounded on the north and south by the only two perennial streams in the vicinity. Indian Creek, which is at the extreme northwest corner of the study area, crosses the Limestone Hills through a rugged limestone canyon. Crow Creek, a perennial tributary to the Missouri River, also flows from west to east and is located just outside the southern boundary of the study area. The Limestone Hills represent the most important mule deer winter range habitat in the Elkhorn Mountains area (Carlsen 1998). In addition, Big Horn sheep were released into the Elkhorns in 1995 and also use the Limestone Hills (Carlsen 1998).

The BLM does not permit MT ARNG training exercises to take place in the Limestone Hills during winter months (approximately December 1 to April 15) to preserve the special habitat area. Other than designated wetlands shown in Figures 3A and 3B, no special habitat areas are identified in the Limestone Hills or Fort Harrison study areas.

4.8 Cultural Resources

This section provides a brief discussion of the area's prehistory and a summary of the status of the cultural resources inventory for the Limestone Hills and Fort Harrison study areas. The section includes a description of sites and structures of historical significance, resources eligible for listing on the National Register of Historic Places, archeological resources, palontological resources, and coordination with Montana historic preservation programs.

The Helena and Townsend valleys have been occupied by Native Americans for centuries. European settlers arrived in the area in the 1860s. Cultural resources found in the Helena and Townsend valleys include remnants of Native American culture and of mining, agricultural, ranching, military, and of frontier exploration. The Lewis and Clark expedition explored both the Helena and Townsend valleys. Captain William Clark recorded the following description of the Limestone Hills in July 1905: "...the Mountains on either Side appear like the hills had fallen half down & turned Side upwards."

4.8.1 Sites of Historical Significance

MT ARNG has commissioned evaluations of both the Limestone Hills and Fort Harrison study areas for sites and structures of historical significance. MT ARNG completed a Cultural Resources Management Plan for structures at Fort Harrison constructed during World War II. The purpose of the plan was to determine which of these facilities should be retained and preserved because of their historical value (MT ARNG 1998). The Limestone Hills area was evaluated in 1980 for cultural resources. Each identified resource was evaluated against assessment criteria and associated levels of significance proposed by the BLM Cultural Resource Evaluation System.

The Cultural Resources Study in the Limestone Hills (Davis and others 1980) identified 271 specific heritage manifestations in the study area (Davis and others 1980). Two sites were determined to be eligible for nomination to the National Register of Historic Places (S1 status), and 16 sites were determined to "hold real potential for elevation to S1 status" (Davis and others 1980). The criteria for a determination of significance at each site in the Limestone Hills were:

depth, architectural features, artistic features, size, age, permanency, uniqueness, association, representativeness, condition, and problem orientation (role of site in solving research problems).

The Cultural Resources Management Plan evaluation of Fort Harrison determined that of the 48 structures surveyed, 15 were recommended for preservation and the remaining 33 were recommended for demolition (MT ARNG 1996). No structures were determined to have adequate significance for National Register eligibility.

4.8.2 National Register of Historic Places Eligibility

Two sites in the Limestone Hills are eligible for the National Register: the Indian Creek Site, and the Pilgrim Site (Figure 2A). The Indian Creek Site (24BW626) is located on private land near Indian Creek at the northeast boundary of the study area in Section 5, Township 5 North, Range 1 East. This site was an open air prehistoric occupation that has been buried and is now weathering out of a slopewash apron and terrace fill. The cultural deposits were deeply buried then overlain by tailings from historical gold mining operations. The cultural stratum is now exposed and defined by wood charcoal interspersed with stone projectile points and small pieces of used mammal bone. Age dating and the stratigraphic location relative to an ash layer deposited by the Mazama Volcano (Crater Lake) indicate that the site was occupied approximately 5,000 years B.C. (about 7,000 years ago). This site has been investigated and recorded through the Museum of the Rockies in accordance with National Register of Historic Places preservation requirements.

The Pilgrim Site (24BW675) is located on state land near the center of Section 16, Township 6 North, Range 1 East. The site is an open air prehistoric habitation, about 12.5 acres in size, situated on terraces bordering an arroyo. The site contains more than 60 stone circles that average 16 feet in diameter. Excavations revealed bone fragments and fragmentary projectile points. Age dating of obsidian points indicates that the site was probably occupied sometime between A.D 200 and 750 (Davis and others 1980). This site was described in the 1980 Cultural Resources Investigation (Davis and others 1980) but has not undergone subsequent study or preservation measures. Because the site is located on state lands, it is currently managed by the State of Montana Department of Natural Resources and Conservation (Melton 1998).

No structures at Fort Harrison have been designated as eligible for listing on the National Register of Historic Places (Montana SHPO 1998).

4.8.3 Archeological Resources

Archeological resources are locations where human activity measurably altered the earth or left deposits of physical or biological remains. Prehistoric examples include arrowheads, rock scatterings, and village traces, whereas historic resources generally include campsites, roads, fences, homesteads, trails, and battlegrounds.

The Limestone Hills study area contains 271 locations identified as cultural heritage sites (Davis and others 1980). Of these site, 184 are isolated archaeological finds, 70 are archaeological sites, six are archaeological/historical sites, and 11 are historic sites. The majority of prehistoric sites occur on benches or terraces and include primarily habitation sites (stone circles, rock shelters, or caves) and prehistoric stone quarry sites. Historic sites include remnants of mining structures, quarries, Old Woman's Grave (believed to be that of Charity Dillon, buried in 1872) and cabin remnants. These sites are identified individually and described in the Cultural Resource Survey report conducted for MT ARNG in 1980 (Davis and others 1980). A complete list of the 271 archaeological sites at the Limestone Hills is provided in Appendix D.

Five historic sites have been identified at Fort Harrison. No prehistoric sites were identified. The historic sites are associated with 1880- to 1900-era mineral exploration and claims. These sites lack intact structures or association with important historic patterns, events, or persons, and have no subsurface components that could provide important information. There is little or no record of production for these claims. None of these sites is considered eligible for the National Register of Historic Places (NHRP) (MT ARNG 1998). One of the two sites, the Blackfeet Road, passes along the northern edge of the parcel. This site is currently used as a county road and is not eligible for the NRHP. The second site was previously interpreted as a possible cavalry guard post associated with Fort Harrison. This interpretation was based on the presence of military issue dishware and silverware found at the site. The estimated time of occupation of this site is 1885; however, Fort Harrison was not established until 1895 and no record of a military facility was found at this location, so the site is not considered a military site and is not eligible for the NRHP (MT ARNG 1998).

4.8.4 Paleontological Resources

Fossiliferous strata exposed as surficial geology in the Limestone Hills (Figure 5A) include the Jefferson Dolomite, Three Forks Shale, and Lodgepole and Mission Canyon Limestones (Perry 1962). Paleozoic fossils collected from these formations in Montana include fragments of marine brachiopods, bryozoans, and echinoderms. Mesozoic fossils include carbonized and silicified wood, marine bivalves, and marine cephalopods. The U.S. Geological Survey has formally designated an area near Indian Creek in Section 5, Township 6 North, Range 1 East of the Limestone Hills as a Mesozoic Fossil Collection Locality (Davis and others 1980). Cenozoic alluvium (near Indian Creek) contains fragmentary remains of terrestrial vertebrates (Davis and others 1980). Fragments of marine brachiopods have been found in the Wolsey Shale at other locations. The Wolsey Shale outcrops in the far western portion of the Fort Harrison study area (Figure 5B)

Bedrock (paleozoic metasediments and granitic intrusion) and unconsolidated sediments (Quaternary alluvium) underlying the Fort Harrison study area are typically not fossiliferous.

4.8.5 Coordination with Other Government Agencies

Mr. Philip Melton of the Montana State Historical Society (SHPO) was contacted for information regarding cultural resources at the Limestone Hills (SHPO 1998). During the scoping process of an environmental assessment completed for proposed renovation at Fort Harrison, SHPO advised MT ARNG to describe how the Army intends to comply with Section 106 of the National Historic Preservation Act (NHPA), as amended in the Federal Register (FR) 36FR800 (MT ARNG 1998).

The Cultural Resources Management Plan that was prepared for Fort Harrison in 1995 and amended in 1997 was developed to establish a clear direction for compliance with SHPO and NHPA Section 106. MT ARNG is currently working with SHPO throughout an ongoing facility renovation process. SHPO has helped identified historic properties and provided guidance for removal or demolition. MT ARNG does not have a programmatic agreement with Montana

SHPO; however, MT ARNG will continue to work with SHPO on all proposed actions at Fort Harrison that affect cultural resources.

4.9 SOCIOECONOMICS

The assessment of socioeconomic effects resulting from the Proposed Action is a function of the selected region of influence (ROI). The region is defined by considering the economic linkages between the residential population and businesses in the geographic area. The Army National Guard has determined that commuting and trading patterns are of prime concern for evaluating socioeconomic effects from proposed actions (Army National Guard 1998). Based on the probable ROI of the Proposed Action, the socioeconomic study area includes Lewis and Clark County and the City of Townsend.

4.9.1 Demographics

Demographics of the socioeconomic study area are defined by a statistical evaluation of the population. Population data for this section were obtained from the U.S. Bureau of the Census based on 1990 census data (U.S. Bureau of the Census 1992) and 1995 School District data (U.S. Bureau of the Census 1996), 1998 Helena Chamber of Commerce information, and 1998 Townsend Chamber of Commerce information.

Townsend has a population of about 1,635 and serves an area of 3,160. Residents in the Townsend area are about 98 percent Caucasian, almost 3 percent Hispanic, and 0.7 percent Native American (U.S. Bureau of the Census 1992). The median age is 36. About 73 percent have a high school diploma and 12 percent hold a bachelor's degree or higher. Almost 60 percent of the population lived in the same house from 1985 to 1990.

The population of Lewis and Clark County is about 53,000. Approximately 74 percent of the residents in the county live in an urban area. The dominant ancestry of the population is western European (72 percent) and Scandinavian (12 percent). According to the 1990 Census report, Lewis and Clark County residents are about 96 percent Caucasian, 0.09 percent African American, 2.2 percent Native American, and 1 percent Hispanic. Approximately 87 percent of Lewis and Clark County residents have a high school diploma. About 28 percent hold a bachelor's degree or higher. The median age in Lewis and Clark County is 34.

Helena serves a population of 58,800 that includes residents in Lewis and Clark County and parts of Broadwater and Jefferson Counties. Helena's population is about 27,000 (Helena Chamber of Commerce 1998). Percent breakdown of race and ancestry is similar to that of Lewis and Clark County. About 90 percent of Helena's adult residents have completed high school; approximately 34 percent hold a bachelor's degree or higher (U.S. Bureau of the Census 1996). Helena is a stable community, as indicated by the long-term residence rate of its population (about 45 percent of its residents had lived in the same house from 1985 until the 1990 census).

4.9.2 Regional Employment and Economic Activity

Primary employers of the residents of Townsend include local, state, or federal government (22 percent), retail businesses, and agriculture (forestry and farming). The unemployment rate is 5.7 percent.

Lewis and Clark County and Helena have a long record of economic stability from the gold rush era to the present. The county's economic stability is due, in part, to the location of state government in Helena. State government payrolls account for 18 percent of worker earnings in the study areas. Federal employment, in addition to the Federal Reserve Bank, comprise another 9 percent of worker earnings. Lewis and Clark County's economy is expected to grow approximately 2 percent through the year 1999 (Helena Chamber of Commerce 1998). The unemployment rate in Lewis and Clark County is 4.1 percent, similar to that of Helena (U.S. Bureau of the Census 1996).

4.9.3 Installation Salaries and Local Expenditures

The Army National Guard employs approximately 170 full-time staff at Fort Harrison and about 65 full-time positions at the Army Aviation Support Facility (AASF) located nearby in Lewis and Clark County, for less than 1 percent of the county's total employment. There are approximately 350 MT ARNG members at Fort Harrison and 250 at the AASF. Most of these part-time guard employees live in the Helena area and have full-time jobs in addition to their guard membership. On a typical monthly drill weekend, 300 to 400 soldiers are at Fort Harrison for training. In addition, units from outside the Helena area use the ranges and other facilities at

Fort Harrison and the Limestone Hills for training. Weekend users stay at Fort Harrison rather than lodge in Helena motels; however Lewis and Clark County businesses benefit from MT ARNG expenditures for food supplies and other requirements to support weekend users (Martinka 1998).

4.9.4 Housing

The 1995 Lewis and Clark County school district data base indicates that there are approximately 21,400 housing units in the county. Median housing value in 1995 was $61,900. Most county houses were constructed after 1960 (63 percent), with the bulk of construction occurring in the 1970s. About 22 percent were constructed before 1939. Most houses have three bedrooms or more. Most county residents are on a community or public water system and are connected to a public sewer system (61 percent). In 1989, the median monthly mortgage payment was $619; the median rent payment was $329 (U.S. Bureau of the Census 1992).

4.9.5 Schools

Townsend public schools serve approximately 390 students with one elementary school and one high school.The Helena school district serves approximately 8,500 students within the Fort Harrison socioeconomic study area. The school district has two high schools, two middle schools, 12 elementary school, one transitional middle school, one alternative high school, and three private schools (Helena Chamber of Commerce 1998). Helena also has an adult educational program. Post-secondary education opportunities are provided at the Helena College of Technology, a 1,000-student school affiliated with the University of Montana; Carroll College, a private 1,500-student college that specializes in a premedical program; and the Helena Vocational Technical Center, which offers 12 programs for approximately 550 students in office and business management, the trades, and industry and technical training.

4.9.6 Medical Facilities

Helena is the center of the health care delivery system for both the Limestone Hills and Fort Harrison socioeconomic study areas. St. Peter's Hospital in Helena provides comprehensive inpatient, outpatient, and home care services including obstetrics, surgery, emergency and paramedic licensed ambulance care, a comprehensive cancer treatment center, and a full range of

diagnostic services. Shodair Hospital provides inpatient and outpatient psychiatric services for children and is a center for genetics research. The Veterans Administration Hospital at Fort Harrison provides a full range of services to eligible veterans. The combined employment for the three hospitals totals nearly 2,000 in the study area. Helena also has four nursing homes providing long-term care.

4.9.7 Shops and Services

As the capital of Montana and a regional shopping center for both the Fort Harrison and Limestone Hills study areas, Helena offers a wide range of shops and services. One major shopping mall and several smaller malls supplement the individual retail establishments on the major transportation routes and in the downtown area. Nearly 100 restaurants are listed in the local phone book yellow pages, including most of the national fast food chains and local specialty restaurants. Townsend has seven restaurants listed in the yellow pages, as well as several retail stores and a grocery store.

Water, sewage disposal, and solid waste pickup are provided to Helena residents (Fort Harrison is located outside of city limits). Natural gas, electricity, and telephone services are available throughout the Fort Harrison study area. Fort Harrison processes its own sewage waste and uses a well for water supply. Other local services for both the Fort Harrison and Limestone Hills study areas include an airport, freight railroad transportation, an intracity bus service in Helena, and an intercity bus service that serves Helena and Townsend.

4.9.8 Recreation Facilities

The Helena area has numerous recreational opportunities. Within the city, Helena has four indoor swimming pools and two outdoor pools for summertime use. Townsend has an outdoor pool. A 20-acre park between Fort Harrison and the City of Helena (Spring Meadow Lake), maintained by the Montana Department of Fish, Wildlife, and Parks, is used for swimming in the summer and ice skating in the winter (Figure 4B). Three golf courses are available in the Helena area, and one in Townsend. The Helena area has at least 25 city parks including Mount Helena, which offers miles of mountain hiking trails just a few blocks from downtown. Other recreational activities within the Helena area include running events, tennis, aerobics, weight

training, horseback riding, ice skating, roller skating, canoeing, hiking, and organized city adult and children leagues for softball, basketball, volley ball, and soccer. Helena also has two semi-professional sports teams: the Helena Ice Pirates (hockey) and the Helena Brewers (baseball). The socioeconomic study areas include the Missouri River and nearby mountains, which provide opportunities for outdoor recreation such as boating, fishing, hunting, hiking, ballooning, rock climbing, photography, downhill and cross-country skiing, and ice sailing.

4.9.9 Public and Occupational Health and Safety

One of the major heath and safety issues of concern in the affected environment is the presence of UXO in the Limestone Hills. MT ARNAG has used the Limestone Hills training areas since the 1950s for maneuvers and live-fire training for Infantry, Armor, Artillery, Engineer, Aviation, and Special Operations units (Youmans and Frohberg 1996). Prompted by a request to the BLM from Continental Lime, Inc. to expand its permitted area to the south, MT ARNG recently conducted an investigation of the area immediately south of the mine for the presence of surface and subsurface UXO. Results of the study will be available in the spring of 1999 (Youmans 1998).

In the Fort Harrison study area, public health and safety are protected by agencies of the City of Helena and Lewis and Clark County. Public health and safety in the Limestone Hills is protected by Broadwater County Family Services and Health Services, the Broadwater Sheriff's Department, the BLM, and the MT ARNG. The City of Helena is served by 43 full-time police officers and 36 full-time firemen. Lewis and Clark County has 25 full-time sheriff deputies and 500 volunteer fire fighters. The Lewis and Clark County Health Department is responsible for monitoring public health and safety issues such as drinking water quality and disease control. The Montana Department of Environmental Quality regulates waste management, toxic substance reporting, and investigation and cleanup of contaminated sites in both study areas. The State of Montana also provides technical and financial assistance for occupational health concerns such as asbestos control, radon emissions, and drinking water.

The Montana Department of Military Affairs (DMA) environmental office provides regulatory guidance to MT ARNG personnel regarding safe use, storage, and disposal of hazardous and

toxic substances. With the help of the DMA Environmental Office, the MT ARNG has a pollution prevention program that includes minimization of hazardous wastes and recycling.

4.9.10 Protection of Children

A growing body of scientific knowledge indicates that children may suffer disproportionately from environmental health risks and safety risks (Army National Guard 1998). The Army National Guard has made it a high priority to identify and assess those environmental health and safety risks. Children are frequently present at Army National Guard installations as residents and visitors. On such occasions, MT ARNG has taken precautions for their safety using a number of means including fencing, limitations on access to certain areas, and provision of adult supervision. Unescorted children are not allowed on training grounds during field exercises (Martinka 1998).

4.10 ENVIRONMENTAL JUSTICE

A NEPA evaluation of a proposed action must include an assessment of effects on minority and low-income populations, and an alternative location or action must be considered if the Proposed Action discriminated against a minority or low-income population. Based on the 1990 Census (U.S. Bureau of the Census 1992), Lewis and Clark County's population is about 97 percent Caucasian and 2.2 percent Native American. Less than 12 percent of the county's population was below the poverty level. Townsend's population is about 98 percent Caucasian and 0.7 percent Native American. About 16 percent of the population lived below the poverty level. By comparison, Montana's population is nearly 93 percent Caucasian and 6 percent Native American, with about 16 percent of the population below the poverty level.

4.11 INFRASTRUCTURE

The most recent Utility Master Plan for the Fort Harrison complex was completed in 1987 by Thomas, Dean & Hoskins. This plan and information obtained from personnel interviews were summarized in the Fort Harrison environmental assessment of proposed construction activities (MT ARNG 1998). The description of infrastructure in the affected environment at Fort Harrison provided in this section is derived from the construction EA (MT ARNG 1998).

4.11.1 Potable Water

Water is currently supplied to the Fort Harrison complex by the City of Helena via a 12-inch main connected to the City system (City of Helena 1997). An 8-inch main connects the Fort Harrison system, to the Veteran's Administration (VA) hospital water system, although this connection is valved off and would be used only in case of an emergency. Current water pressure supplied by the city system is 150 pounds per square inch (psi). The existing system does not have on-line storage capacity, although the VA system includes a 500,000 gallon storage tank that is available for use during an emergency. The system distribution is via 6-inch and 8-inch cast iron or steel pipe. The system is valved and has hydrants to provide fire protection (MT ARNG 1998). Deficiencies noted during preparation of the master plan included fire hydrants on undersized mains, inadequate valving, outdated hydrants, lack of storage, and deterioration of the distribution system (City of Helena 1997). Potable water is provided at the Limestone Hills from groundwater that is treated for coliform by ultraviolet light (Martinka 1998).

4.11.2 Sewage Treatment

The existing sanitary sewer system consists of 8-inch laterals and a 12-inch trunk line (City of Helena 1997). Treatment occurs in two 5-acre sewage lagoons (Martinka 1998). The trunk lines and lagoons were built by the VA approximately 30 years ago and are used jointly by MT ARNG and the VA hospital (MT ARNG 1998). The MT ARNG has concluded that the existing system is adequate to handle current loads as well as any projected increases. The capacity is more than twice the projected demand (MT ARNG 1998).

4.11.3 Stormwater System

There is currently no underground storm drainage system at the Fort Harrison complex. All storm drainage is handled via the use of open ditches. Two major drainages cross the complex in an east-west direction. Several of the culverts diverting this runoff under roadways are considered undersized (Peccia 1997). The area between the maintenance shop and the Unit Training Equipment Site (UTES) have historically experienced flooding problems (Peccia 1997). Other drainage problems include alternation of a historic drainage channel by construction of railroad berms, access roads, parking areas, and buildings. In most instances, construction of

these facilities did not provide for adequate drainage control (Peccia 1997). Stormwater drainage management in the Fort Harrison study area is being evaluated for infrastructure improvements (Youmans 1998).

4.11.4 Solid Waste Disposal

Solid waste generated during field training at Fort Harrison is collected and disposed of in the county landfill via the Helena Transfer Station. There are no operating landfills on the base. Fort Harrison recycles paper, cardboard, and packing materials, and maintains data on recycling under Department of Military Affairs, Montana Regulation 200-8 (MT ARNG 1998). An estimated 1,000 pounds of shells and spent practice munitions are recovered each month (including materials from the Limestone Hills training area) (MT ARNG 1998). Solid waste is stored in a dumpster at the Limestone Hills and collected by a private contractor (Martinka 1998).

4.11.5 Natural Gas

Natural gas service to Fort Harrison is provided by Montana Power Company. Natural gas accounts for nearly 50 percent of all energy use on the base, according to a 1996 energy audit of the site (MT ARNG 1998). The Limestone Hills training area is not served by natural gas.

4.11.6 Electrical Service

Electrical service to Fort Harrison and the Limestone Hills is provided by Montana Power Company. Electricity accounts for slightly more than 50 percent of all energy use on the base, according to a 1996 energy audit of the site (MT ARNG 1998). Each building on base is separately metered.

4.11.7 Transportation System

Fort Harrison can be reached by two routes: County Club Drive, which approaches the site from the southwest on a county road (Figure 2B); and a county road that approaches from the south via US Highway 12. No other roadways access the site. The Limestone Hills are reached from Highway 12.

4.11.8 Rail Service

Rail access for freight is provided from the north on a rail spur maintained by Montana Rail Link. This spur provides service to the northern part of the site only and does not continue into the main complex.

4.11.9 Air Operations

All air operations to the site originate at the Army Aviation Support Facility located at Helena Regional Airport. No private air operations are allowed in the airspace above the military complex.

4.12 HAZARDOUS AND TOXIC MATERIALS/WASTES

The environmental programs at Fort Harrison include hazardous materials, hazardous waste, the Installation Restoration Program (IRP), solid waste, and wastewater. Although other programs are also managed by the MT ARNG Environmental Office (with support from other offices for several programs), the programs listed are potentially affected by the Proposed Action and will be addressed in this document. All programs are managed in accordance with applicable federal, state, local, and DoD regulations, standard, and laws. Current MT ARNG activities are being properly managed under programs for hazardous materials, hazardous waste, solid waste, and wastewater. The IRP addresses contaminated areas at the base that have resulted from past activities.

MT ARNG has substantially reduced hazardous material use in recent years. An emphasis on material reduction and changed shop practices have reduced the number of types of hazardous material from more than 200 to less than 70. Quantities used have also decreased by an average of 60 percent for all MT ARNG locations (MT ARNG 1998).

Overall, MT ARNG hazardous waste quantities have decreased by about 80 percent since 1993, the established baseline year. A 90-percent reduction from 1993 was projected for the end of 1996 (MT ARNG 1998). The decrease has occurred as a result of implementing pollution prevention initiatives (MT ARNG 1998). For example, as a result of procedural changes, sump

sludge is now disposed of by landfarming, and fuels from the waste stream by blending and use in the MT ARNG energy recovery program. New equipment, such as filtering and hot water parts washers, are reducing waste quantities. Finally, the use of substitute products, such as rechargeable batteries, is also reducing the amount of hazardous waste generated.

These changes have reduced the impact of changing or new operations as well as existing operations. The small quantities of waste that are generated by MT ARNG (for example, from vehicle maintenance or equipment cleaning) would be reduced. Because little waste is generated from the activities (Fort Harrison is a small-quality generator, and the training areas are very small contributors), there are no significant issues associated with the current hazardous waste program.

The six IRP sites that have been identified are located away from training areas. Activities that could disturb the sites (such as trenching) are identified before they are initiated, and the sites are not disturbed. Based on the results of the 1994 site inventory, it was determined that further investigation of these sites was not necessary (PRC 1996).

4.12.1 Hazardous Materials

Hazardous materials are substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment if released. These materials are specifically defined by certain laws. For this document, substances identified as hazardous in the Occupation Safety and Health Act are considered hazardous materials. Examples of hazardous materials used by MT ARNG are fuels, oils, cleaning solvents, paints an thinners, and munitions (Lahti 1998, Youmans 1998).

Most of the hazardous material used by MT ARNG is fuel. Diesel fuel is the only fuel stored on Fort Harrison. All gasoline is purchased in Helena with U.S. government credit cards, so there is no gasoline stored on base. The diesel is stored at the Unit Training Equipment Site in two aboveground, double-walled tanks. Diesel is dispensed through pumps and input and output are monitored carefully. All diesel fuel is received at Fort Harrison via commercial trucks. Fuel spill kits are kept on site for rapid response to any type of spill. (MT ARNG 1998).

Other hazardous materials, excluding munitions, are managed under the Department of Military Affairs-Montana Regulation 200-8, Pollution Prevention Program, which emphasizes reduction in on-hand stocks.

MT ARNG has an Oil and Hazardous Substance Spill Prevention and Response Plan that is reviewed and updated annually. This plan provides for contingency planning and spill preparedness, and is designed to prevent, limit, or respond to any spills.

4.12.2 Hazardous Waste

The use of hazardous materials can, in turn, create hazardous wastes. Hazardous wastes, as defined for this document, include those substances identified by the Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Superfund Amendments and Reauthorization Act (SARA), and subsequent amendments. These substances would include, for example, used solvent or paint wastes. Fort Harrison is designated a small quantity generator (EPA ID# MT8211830080). The total MT ARNG waste output in 1996 was 1,327 ponds (MT ARNG 1998).

Management of hazardous wastes consists of collection, storage, transportation, and disposal as required by RCRA, Montana hazardous waste regulations (Montana Code Annotated Title 16, Chapter 44, Section 101 et seq.), and DMAMT Regulation 200-1 (U.S. Department of the Army. 1990).

All records and tracking documents are maintained at the initiating facility, as well as by the Environmental Office. Comprehensive training is provided by the Hazardous Waste Manager of the Environmental Office and is available to all personnel. The environmental coordinator at the AASF is the installation accumulation point manager for a RCRA- permitted storage facility. Hazardous wastes are disposed of through the Defense Reutilization and Marketing Office (DRMO) in Great Falls, Montana.

4.12.3 Unexploded Ordnance

Unexploded ordnance (UXO) is any munition, weapon delivery system, or ordnance item that contains explosives, propellants, or chemical agents. The items are referred to as UXO if they are (1) armed or otherwise prepared for action; (2) are launched, placed, fired, or released in such a way that they cause hazards; and (3) remain unexploded either through malfunction or design. UXO has been present in the Limestone Hills and the Fort Harrison study areas because ordnance failed to fully detonate upon impact after being fired.

Portions of the Limestone Hills study area have been used for as a firing range since the 1950s, resulting in a risk of encountering UXO. UXO hazard in the Limestone Hills has been evaluated by the U.S. Army Corps of Engineers (COE) and the MT ARNG. Based on the results of a survey conducted by the COE in 1993 (Lee 1993), the BLM closed more than 8,000 acres of public land west of Old Woman's Grave Road (Youmans and Frohberg 1996). Since that time, a mining operation adjacent to the impact area (Continental Lime Inc.) has expressed an interest in expanding its operation south of its existing boundary. Old Woman's Grave Road and the mine boundary are shown in Figure 2A. In the summer of 1998, MT ARNG investigated portions of this proposed expansion area for surface and subsurface UXO using highly sophisticated geophysical technology and a statistical sampling approach. Results of this study will be available in the spring of 1999.

Because the Fort Harrison study area has been an active military base for over 100 years, portions of the study area also contain UXO (Youmans 1998). The Fort Harrison study area has not undergone extensive investigation for UXO hazard, however, UXO from the World War I era has been identified in the study area. Historical firing ranges and potential ordnance burial areas may be present at several locations in the study area. Specific UXO hazard areas will be delineated as funds allow and are expected to be located in the west and northwest portions of the Fort Harrison study area.

SECTION 5.0 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential for significant impacts to the human environment that could result from implementation of the Proposed Action or the No Action Alternative. A discussion is provided for each of the environmental and socioeconomic resource areas that are described in Section 4.

As defined in 40 CFR §1508.14, the human environment is interpreted to include natural and physical resources, and the relationship of people with those resources. Accordingly, this analysis of the project has focused on identifying the types of impact and estimating their potential significance.

The concept of "significance" used in this assessment includes both the context and the intensity or severity of the impact, as defined by 40 §1508.27. Severity of an impact could be based on the magnitude of change, the likelihood of change, the potential for violation of laws or regulations, the context of the impact (both spatial and temporal), degrees of adverse effect to specific concerns such as public health or endangered species, and the resilience of the resource.

If a resource is not affected by existing activities or would not be affected by a proposed activity, a finding of no impact would be declared. If a resource has been measurably improved by existing activities or would be measurably improved by a proposed activity, a beneficial impact is noted. If the proposed activity has a detrimental effect on a resource, a negative impact is noted.

5.1 LOCATION

The Proposed Action and the No Action Alternative elements will all occur on or adjacent to the existing Fort Harrison complex and the Limestone Hills training areas.

5.1.1 Potential Impacts of the Proposed Action

No additional land acquisition is necessary to accommodate the objectives of the Proposed Action. The Proposed Action is in support of the existing mission: to be prepared to participate in global security for the United States. No expansion of personnel would be required. There

would be no adverse impacts to the Limestone Hills or the Fort Harrison study areas resulting from the Proposed Action. Current training exercises using tracked vehicles would not significantly change the number of vehicle miles per year traveled during training exercises (Martinka 1998), thus creating no significant impact to the existing condition within the study areas.

5.1.2 Potential Impacts of the No Action Alternative

As stated in Section 2.5.2, the federal government is reducing the size of active duty military forces and the military bases. This reduction increases the need for the National Guard to assume additional responsibility for national defense. The federal government has recognized the need for a combat-ready National Guard by providing upgraded training equipment whenever possible. The Proposed Action provides upgraded versions of tracked vehicles currently used for training by MT ARNG personnel. The potential for loss of training, if the Proposed Action does not take place, would have an adverse and significant negative impact on the U.S. Army and other federal agencies in their ability to train MT ARNG personnel.

5.2 LAND USE

Impacts to land use from the Proposed Action on the Fort Harrison and Limestone Hills study areas would be insignificant.

5.2.1 Potential Impacts of the Proposed Action

The Proposed Action would not significantly change the frequency or nature of vehicular or shooting training exercises that result in land disturbance under existing conditions. All proposed activities would be in support of the existing mission and would not require additional personnel. Proposed activities would be in accordance with local and federal land use plans for the Fort Harrison and Limestone Hills study areas. Landscape visual resources and building architecture of the Fort Harrison and Limestone Hills study areas would not change from existing conditions as a result of the Proposed Action. Property ownership described under Section 4.2.4 of the Affected Environment would remain the same. The Proposed Action would not expose sensitive receptors to noise or air contamination that exceeds existing conditions so

that adjacent land values would not be affected. Impacts to land use within the study area or land values adjacent to the study area would be none or insignificant.

5.2.2 Potential Impacts of the No Action Alternative

The primary impact of the No Action Alternative would be a decrease in the use of vehicles for driver's training and shooting practice, resulting in a decreasing ability for the National Guard to provide adequate training opportunities for the personnel using the MT ARNG Fort Harrison and Limestone Hills facilities. The No Action Alternative, of decommissioning the existing 2-163rd Armored Battalion and not receiving equipment for the Cavalry Unit, would result in fewer vehicular training exercises, less road use, and reduced use of shooting ranges in the affected environment. The No Action Alternative would not result in increased value of adjacent land.

5.3 AIR QUALITY

With the exception of short-term dust during tank driver training exercises, existing MT ARNG training operations currently have minimal to no impact on air quality in the Helena and Townsend valleys. Impact to air quality would not change as a result of the Proposed Action.

5.3.1 Potential Impacts of the Proposed Action

The Proposed Action would result in the generation of dust (including PM^{10}) during by training and road maintenance. Because the quantity of dust emissions from training operations would be related to the number of vehicles being used, the level of activity, the conditions of the roads at the time of the operations, and road maintenance conducted, no significant change is expected to occur between existing conditions described in Section 4.3.2 of the Affected Environment and the Proposed Action. Consequently, no significant change in air quality impacts from use of the Cavalry Unit equipment during training in the affected environment would occur.

5.3.2 Potential Impacts of the No Action Alternative

The No Action Alternative would include fewer vehicle driver training exercises, in particular with tracked vehicles, reducing the short-term localized generation of dust. All other air emissions in the affected environment would continue to occur at existing levels.

5.4 NOISE

This section evaluates the significance of the potential change in the noise environment that would result from the Proposed Action and No Action Alternative. Impacts are a function of the magnitude of the noise levels that would be generated by the Proposed Action that would be in excess of, or less than, noise currently generated under existing training activities. The basis for determining the significance of the impact is primarily the difference between the baseline noise environment and that of any changes. An appreciable increase in the existing noise levels in the study areas would be perceived as an annoyance impact.

5.4.1 Potential Impacts of the Proposed Action

The Proposed Action would result in tank maneuver and gunnery training operations similar to the existing conditions (Martinka 1998). No changes in the number of personnel are anticipated. Noise sources and sensitive receptors described in Section 4.4 is not expected to change. Consequently, no significant noise impacts for use of firing ranges and vehicle maneuver training exercises in the affected environment would occur.

5.4.2 Potential Impacts of the No Action Alternative

Under the No Action Alternative, gunnery exercises would continue at approximately the same frequency and intensity. There would be no significant reduction in noise under the No Action Alternative.

5.5 GEOLOGY AND SOILS

Geologic resources in the affected environment are described in Section 4.5.2 and include mining and paleontological resources. Under existing conditions, mining activities are restricted

by past and ongoing use of portions of the Limestone Hills for gunnery range practice and because resources can be economically obtained elsewhere. The restricted area includes most of the surface danger zone and all of the impact area delineated in Figure 2A. Other mining resources and paleontological resources are addressed in Section 5.8 (Cultural Resources) and are generally limited to limestone formations in the Limestone Hills. Soils resources in the affected environment are described in Section 4.5.4 as primarily shallow, well-drained soils with a severe erosion hazard and moderate permeability.

5.5.1 Potential Impacts of the Proposed Action

Increased adverse impacts to mining, paleontologic, and soil resources would not be expected as a result of the Proposed Action. The range of fire using weapons from the Cavalry Unit equipment would not create a larger surface danger zone than results under existing conditions, and the predicted impact area would be the same as shown in Figure 2A for the Limestone Hills (Mohan 1998). Heavy artillery would not be fired at Fort Harrison; the type of weapons fired at Fort Harrison would be limited to the same that are currently fired under existing conditions. Because the impact area and surface danger zone would not be larger than under existing conditions, there would be no significant impact to geologic resources in the affected environment. Regardless of proposed activities, seismic risks associated with active faults in the east part of the Fort Harrison study area and faults in the Limestone Hills study area would continue at existing levels, as described in Section 4.5.3.

Soil resources currently are affected by road use and stormwater runoff, and would continue to be affected without significant change under the Proposed Action. Prime agricultural land would be unaffected by the Proposed Action. The M1A1 tank weighs approximately 5 percent more than the currently fielded M1 MBT. This increased weight would exert additional ground pressure when compared to equipment used under existing conditions. Because no tank training exercises occur off-road, this difference would not significantly increase impacts to soil.

5.5.2 Potential Impacts of the No Action Alternative

Under the No Action Alternative, use of roadways for tracked vehicle driver's training exercises would decrease, decreasing potential impacts to soil resources on and near roadways. The

potential for unexploded ordnance in the Impact Zone would still exist, and mining restrictions in that area would continue under the No Action Alternative. No adverse impacts to geology and soils resources are predicted under the No Action Alternative.

5.6 WATER RESOURCES

Water is a finite but renewable resource; its quality can be degraded by dissolved contaminants and sediment loading, and can be altered by physical disturbances that change the hydrology of the area. An impact to water resources would be considered potentially significant if an aquifer, groundwater well, or surface water body is adversely affected, resulting in a measurable change in water quality. A decrease in groundwater recharge and increase in runoff could also be significant if the stormwater system could not adequately handle the increased volume of water. No impact would result if no measurable change would occur. A beneficial impact would result from an improvement to water quality or quantity by decreasing contaminant levels, increasing groundwater recharge, or decreasing the potential for future contamination.

Under the Proposed Action and the No Action Alternative, water resources (groundwater, surface water, and water quality) would not be negatively affected.

5.6.1 Potential Impacts of the Proposed Action

Groundwater would not be adversely affected by the Proposed Action. Groundwater in the Limestone Hills study area is used for drinking water by MT ARNG personnel. It is currently treated for coliform bacteria (Martinka 1998) and produces an adequate supply for use during training activities. Wells in the study area that were installed for domestic use are deeper wells (greater than 100 feet below ground surface) and not susceptible to contamination from storm water runoff or the types of surficial activities describe in the Proposed Action. The Proposed Action includes ongoing use of a waste disposal service and portable self-contained latrines that also reduce the risk of contamination to groundwater. Groundwater in the Fort Harrison study area is currently used for domestic supply and irrigation by private landowners (MBMG 1998) and for irrigation by the MT ARNG (Martinka 1998). The Proposed Action would not increase the use of groundwater nor would it result in activities that could contaminate potable aquifers.

For the most part, surface water in both the Limestone Hills and Fort Harrison study areas occurs temporarily in ephemeral and intermittent streams. Surface water within and adjacent to both study areas is at risk to contamination during spring snowmelt and high storm water runoff. Under the Proposed Action, uncontrolled storm water runoff could deposit sediment generated from erosive soils in surface water bodies. Because occasional discharge of sediment-laden storm water to a surface water body also occurs under existing conditions, and the Proposed Action does not include activities that would increase the risk of erosion or sediment-laden discharge, the Proposed Action does not have the potential to significantly increase surface water contamination in the Limestone Hills or Fort Harrison study areas.

5.6.2 Potential Impacts from the No Action Alternative

Under the No Action Alternative, training exercises with tracked vehicles would be significantly reduced, reducing the potential for soil erosion on and near roadways in both study areas. Reduced soil erosion would reduce the amount of sediment carried by storm water and potentially discharged to surface water, thereby reducing adverse impacts to surface water bodies. Because groundwater quality and quantity are not adversely affected by existing training activities using vehicles similar to those that would be used under the Proposed Action, groundwater in both study areas would not be adversely or positively affected by the No Action Alternative.

5.7 BIOLOGICAL RESOURCES

Biological resources are plants and wildlife, including sensitive, federally or state-listed endangered or threatened species, and wetland areas. Impacts to biological resources could be significant if the viability of protected plant or animal species were jeopardized, with little likelihood that they could be re-established after the action is completed. A lesser impact could result if the disturbed population could be reestablished to its original state and condition, or the population were sufficiently large or resilient to respond to the action without a measurable change. The significance of an impact also depends on the importance of the resource, and the proportion of the resource that could be affected relative to its occurrence in the vicinity. An increase in population numbers in response to an enhanced habitat, or the increased viability of a species, could be considered a beneficial impact. Significant impacts to wetlands could occur if

activities associated with the Proposed Action resulted in altered hydrologic flow, drainage of sediment or contaminants into surface waters or wetlands areas, or actual filling or destruction of a wetland area (MT ARNG 1998).

Impacts to biological resources at the Limestone Hills and Fort Harrison study areas from existing activities result primarily from foot and vehicular traffic, bivouacs, heavy artillery range practice and helicopter flyovers (MT ARNG 1998). These activities do not lead to degradation of critical habitat or risk the viability of threatened or endangered flora or fauna. Implementation of the Proposed Action would not result in any significant change in these activities and, as such, would not significantly affect vegetation, wildlife, and wetlands beyond existing conditions. No adverse impacts are likely to occur to sensitive, threatened, or endangered species as a result of the Proposed Action.

5.7.1 Potential Impacts of the Proposed Action

The Proposed Action restricts vehicular traffic to existing roads and artillery practice to delineated impact areas in both the Limestone Hills and Fort Harrison study areas. All proposed use areas have previously been disturbed. These proposed activities would have a minimal impact on existing vegetation.

Critical habitat areas exist in both study areas and in the western portion of the Limestone Hills during winter (mule deer). Proposed activities would not take place in wetlands areas or in critical winter range areas during the period from December 1 through mid April. The Proposed Action would not adversely affect critical habitat areas in the affected environment.

The Montana Natural Heritage Program (MNHP) maintains an inventory of the elements of biological diversity in Montana. The inventory focuses on plant species, animal species, plant communities, and biological features that are rare, endemic, disjunct, threatened, or endangered throughout their range or in Montana, vulnerable to extirpation from Montana, or in need of further research. The MTNHP survey indicated the presence of no threatened or endangered species in the affected environment (MTNHP 1998). A recent evaluation of the affected environment for bats and reptiles determined that the Limestone Hills potentially supports several species of bats and that no bats were sited in the Fort Harrison study area (WESTECH

1997). Locations of bat sightings are outside of artillery impact areas and roadways slated for use in the Proposed Action (Figure 8A).

The Proposed Action would not result in any impacts to wetlands. No activities currently take place within or adjacent to two mesic (wet) areas (MT ARNG 1998). Proposed activities would not also not occur in the vicinity of designated wetland areas (Figures 3A and 3B).

5.7.2 Potential Impacts of the No Action Alternative

The No Action Alternative would not have any effect on the biological resources in the Limestone Hills and Fort Harrison study areas.

5.8 CULTURAL RESOURCES

Cultural resources are limited, nonrenewable resources that may easily be diminished in value by physical disturbances. The criteria used to determine the significance of impacts on cultural resources include the effects on NRHP eligibility, future research potential, or suitability for religious or traditional uses. An impact could be significant if it resulted in the physical alteration, destruction, or loss of a resource listed or eligible for listing on the NRHP. An adverse impact would not be significant if only slight portions of the resource were affected or if the value of the resource was not great. The impact of the action could be beneficial if it protected or reconstructed the resource (MT ARNG 1998).

The affected environment contains two cultural resources determined to be eligible for the National Register of Historic Places (see Section 4.8). Both are located in the Limestone Hills study area, and one (the Pilgrim site) is within the impact area of the firing range shown in Figure 2A. National Register properties are distinguished by having been documented and evaluated according to uniform standards. These criteria recognize the accomplishments of all peoples who have contributed to the history and heritage of the United States and are designed to help state and local governments, federal agencies, and others identify important historic and archeological properties worthy of preservation and of consideration in planning and development decisions. Other cultural resources, such as scattered prehistoric camp remains,

historical mining camps, and paleontological resources are located throughout the affected environment and described under Section 4.8.

5.8.1 Potential Impacts of the Proposed Action

The Proposed Action would affect cultural resources in the Limestone Hills study area. However, the impact is considered insignificant given previous mitigation measures required by the Montana State Historic Preservation Office. The Limestone Hills Pilgrim site described in Section 4.8 has been damaged under existing activities and would continue to be damaged under the Proposed Action. The site has been thoroughly characterized in accordance with National Register standards (Davis and others 1986) and, as such, is considered preserved by the Montana Historical Society (Melton 1998). Because implementation of the Proposed Action would be similar to existing activities, and cultural resources potentially damaged by proposed activities have been preserved on record, the Proposed Action would not result in a significant impact to cultural resources in the affected environment.

5.8.2 Potential Impacts of the No Action Alternative

Because artillery fire practice may continue if the No Action Alternative is implemented, the No Action Alternative could result in the same impact as was described for the Proposed Action.

5.9 Socioeconomic Environment

Socioeconomic resources include elements such as employment, income, and population, which are considered within a specific region of influence as described in Section 4.9. Significance criteria for socioeconomic resources are determined by analyzing long-term fluctuation in elements such as employment and population within a region of influence. This analysis allows a determination of the appropriate levels, or thresholds, beyond which changes in population or employment would noticeably affect individuals and communities with the ROI. Based on this methodology, a significant impact for the ROI (Lewis and Clark County and Townsend, Montana), would be a change of more than 2.0 percent in projected employment or population (MT ARNG 1998). Generally, increases in employment and income are considered beneficial, unless those increases are accompanied by large, rapid population increases that overwhelm the capacity of the local housing market, school, and government services.

5.9.1 Potential Impacts of the Proposed Action

The Proposed Action does not change (addition or loss) MT ARNG full-time or part-time personnel and so would not result in a change in population, employment, or income distribution in the ROI. Housing, school, medical facilities, shops, and local services in the ROI would remain the same as existing conditions described in Section 4.9 if the Proposed Action were implemented. Recreational access under existing conditions are restricted in part of the Limestone Hills study area due to risk from unexploded ordnance. This condition would not change under the Proposed Action.

5.9.2 Potential Impacts of the No Action Alternative

Implementation of the No Action Alternative may result in reduced training frequency and extent. Reduction in training opportunities would result in a reduction of out-of-town visitors and potentially a reduction in opportunities for MT ARNG personnel to advance. Potential impacts from these reduced opportunities could result in loss of income for local businesses that serve Fort Harrison. Because MT ARNG employs less than 1 percent of the total employment in the ROI, and because training exercises would continue at Fort Harrison, impacts to the local economy from implementation of the No Action Alternative would be adverse but insignificant.

5.10 ENVIRONMENTAL JUSTICE

Pursuant to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, the Proposed Action and No Action Alternative must be evaluated to determine whether they could result in any disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

5.10.1 Potential Impacts of the Proposed Action

Because the Proposed Action would take place in an ROI that includes a lower percentage of minorities than elsewhere in Montana and that has a slighter higher average household income than the average for Montana (Section 4.10), implementation of the Proposed Action would not

present a disproportionate impact to human health or the environment of minorities or low-income populations in Montana. In addition, there would be no additional burdens imposed on local minority or low-income services as a result of the Proposed Action.

5.10.2 Potential Impacts of the No Action Alternative

The No Action Alternative would create no significant impact on social justice in Lewis and Clark County or Townsend, Montana.

5.11 INFRASTRUCTURE

Infrastructure in the affected environment is described in Section 4.11. The potable water supply system, waste management operations, natural gas system, electrical service, and roadways are adequate for existing conditions at the Fort Harrison study area (MT ARNG 1998). Water supply, waste management, electrical service, and roadways are also adequate for existing use at the Limestone Hills study area (Martinka 1998). Storm water management structures are currently under review for areas of potential improvement.

5.11.1 Potential Impacts of the Proposed Action

The Proposed Action would not impose additional demands on existing infrastructure beyond current conditions and would not result in a significant impact to infrastructure in the affected environment.

5.11.2 Potential Impacts of the No Action Alternative

There would be no significant impact on infrastructure elements under the No Action Alternative.

5.12 HAZARDOUS AND TOXIC MATERIALS/WASTES

The MT ARNG currently has an effective pollution prevention strategy that includes waste minimization through reuse and recycling; hazard reduction through the replacement of hazardous materials such as chlorinated solvents with citrus-based solvents; and education

programs in best management practices for the storage, use, and disposal of all hazardous and toxic materials and wastes. The highest volume of hazardous materials managed under the Proposed Action are stored and transported fuel and unexploded ordnance. An impact would be significant if quantities of wastes generated were to exceed regulatory limits or existing disposal capabilities. There would also be a significant impact if workers or the general public were exposed to hazardous materials or wastes above health criteria levels. A beneficial impact would occur if hazardous material or various waste quantities are reduced or eliminated.

5.12.1 Potential Impacts of the Proposed Action

The Proposed Action would not generate unexploded ordnance at a rate greater than existing activities. Roughly the same number of vehicular miles per year would be traveled under the Proposed Action as under existing conditions, resulting in roughly the same volume of fuel to be stored and transported for use in the Limestone Hills study area. Impacts as a result of the Proposed Action would remain the same as under existing conditions.

5.12.2 Potential Impacts of the No Action Alternative

Under the No Action Alternative, less fuel would be managed, resulting in potentially a significant decrease in the volume of fuel to be stored and transported in the Limestone Hills study area. Impacts as a result of the No Action Alternative would be beneficial.

5.13 CUMULATIVE IMPACTS

The previous sections describe the potential impacts that could occur at Fort Harrison as a result of the proposed Cavalry Unit transfer to the MT ARNG. NEPA also requires that EAs evaluate whether the Proposed Action could result in cumulative environmental impacts. Cumulative impacts were identified by comparing the potential impacts of the Proposed Action and other past, current, or proposed actions in the area to establish whether, in the aggregate, they could result in environmental impacts.

This section describes unavoidable and cumulative impacts as a result of implementing the Proposed Action or No Action Alternative. The results of this analysis indicate that no cumulatively significant impacts are projected to occur.

5.13.1 Location

Tank and vehicle driver's training exercises, range firing, and field training exercise would continue at approximately the same levels if the Proposed Action were implemented. Tank and vehicle driver's training would be significantly reduced under the No Action Alternative. The beneficial impact to maintaining the mission of the MT ARNG would continue under the Proposed Action. The No Action Alternative would result in an unavoidable adverse impact to the efforts of the MT ARNG to fulfill its mission.

5.13.2 Land Use

No cumulatively significant impact to land use would occur as a result of the Proposed Action or the No Action Alternative.

5.13.3 Air Quality

Field training exercises would continue at approximately the same levels, resulting in an increase in local particulate concentrations during driver's training exercises on dusty roads. This impact would not be potentially greater than existing conditions, and would be expected to decrease if mitigated through the application of dust suppressant during training. No cumulatively significant impact to a would occur as a result of the Proposed Action or the No Action Alternative.

5.13.4 Noise

No cumulatively significant impact to noise would occur as a result of the Proposed Action or the No Action Alternative.

5.13.5 Geologic Resources

No cumulatively significant impact to geologic resources would occur as a result of the Proposed Action or the No Action Alternative.

5.13.6 Water Resources

No unavoidable or significant cumulative impacts are predicted for the Proposed Action.

5.13.7 Biological Resources

No unavoidable or significant cumulative impacts would occur under the Proposed Action.

5.13.8 Cultural Resources

An unavoidable impact to the Pilgrim site cultural resource has been identified. This impact would occur with or without implementation of the Proposed Action. The impact to the Pilgrim site has been mitigated by cataloging the site in accordance with National Register of Historic Places requirements.

5.13.9 Socioeconomic Resources

No unavoidable impacts are expected to occur. No cumulatively significant socioeconomic impacts are likely. The proportion of the MT ARNG's contribution to the local economy based on proposed activities in this EA would not be significant.

5.13.10 Infrastructure

No unavoidable or significant cumulative impacts would occur under the Proposed Action.

5.13.11 Hazardous and Toxic Waste/Materials

Implementing the Proposed Action would not change the type or amount of activities that occur within the affected environment. Although unavoidable impacts of waste generation (solid, hazardous, and wastewater), hazardous material usage (primarily fuel), and UXO risk would continue to occur under these existing activities, no new unavoidable impacts would result from implementing the Proposed Action. No cumulatively significant impacts to environmental programs are projected to occur under the Proposed Action. UXO hazard will be better defined and mitigated through the efforts of ongoing investigations and risk assessments.

5.14 COMPATIBILITY OF THE PROPOSED ACTION WITH OBJECTIVES OF FEDERAL, STATE AND LOCAL LAND USE PLANS, POLICIES AND CONTROLS

The Proposed Action would be compatible with existing federal, state, and local land use plans, policies, and controls. The action would also be consistent with current activities in the affected environment.

SECTION 6.0 CONCLUSION

In accordance with the Council on Environmental Quality regulations implementing the National Environmental Policy Act of 1960, as amended, and Army Regulation 200-2, an evaluation of the identified and cumulative effects has been prepared for the actions described in the Environmental Assessment. The determination has been made that the action will have no significant impact to the quality of the human or natural environment. Therefore, an Environmental Impact Statement is not warranted.

6.1 COMPARISON OF ALTERNATIVES

This EA provides a comparison of the Proposed Action and a No Action Alternative in Chapter 5. Air and soil resources would be adversely affected (adverse and not significant) by the Proposed Action and not by the No Action Alternative. Impacts to these resources would be the same under existing conditions and include dust generated by vehicular use on unpaved roads, and soil erosion. The No Action Alternative would reduce the number of vehicles available for drivers training exercises, reducing the impacts to roadways and air. Resources adversely affected under the No Action Alternative that would not be under the Proposed Action include: military readiness (adverse and significant) and socioeconomic resources (adverse and not significant).

6.2 MITIGATION MEASURES

The 1978 CEQ regulations for implementing NEPA recognizes the following five means of mitigating an environmental impact:

- Avoidance (No Action)
- Limitation of Action (Minimization)
- Restoration of Environment (Remediation)
- Preservation and Maintenance Operation (Reduction)
- Replacement (Compensation)

Proposed measures to mitigate adverse impacts that were identified as part of this EA are noted below, as applicable.

Location

The No Action Alternative would result in an unavoidable and significant adverse impact to the efforts of the MT ARNG to fulfill its mission. This impact would be mitigated by implementation of the Proposed Action.

Air Quality

Use of dust suppressants during driver's training exercises would reduce the local contribution of particulate matter to air resources.

Geologic Resources and Hazardous Materials

Restrictions on mining portions of the limestone ridge in the Limestone Hills study area may be mitigated by the findings of ongoing UXO investigations in the area south of the present mine boundary. Ongoing UXO investigations will also continue to mitigate impacts to public and worker health and safety in the Limestone Hills area.

Cultural Resources

Impacts to the Pilgrim site from past training exercises and the Proposed Action and No Action Alternative have been mitigated by cataloging the site in accordance with National Register of Historic Places requirements.

Socioeconomic Resources

Under the No Action Alternative, the Cavalry Unit equipment would not be transferred, yet the 2-163rd Armored Battalion M1 battle tanks would be decommissioned, resulting in the reduced need for guard personnel and reduced availability of training vehicles. This impact would be mitigated by implementation of the Proposed Action.

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Appendix A

Information Sources for Figure Data

LANDUSE
FIG 4A

Montana State Library
GIS Data Dictionary

Metadata for Major Land Uses in Montana

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Full FGDC-compliant Metadata

GIF Browse Graphic

Identification_Information:

Citation
  Originator: Montana State Library
  Publication_Date: 09/22/1993
  Title: Major Land Uses in Montana
  Online_Linkage: http://nris.state.mt.us/nsdi/nris/e00/lu23.zip
  Online_Linkage: http://nris.state.mt.us/nsdi/nris/shape/lu23.zip
Description
  Abstract:
    Major land uses in Montana from the National Atlas of the United States, (1970) page 158.
  Purpose:
    Display and analysis of small-scale land use patterns.
Time_Period_of_Content
  Beginning_Date: 01/01/1950
  Ending_Date: 01/01/1967
Access_Constraints:
    None
Use_Constraints:
    Not for use at scales greater than 1:7,500,000.
Native_Data_Set_Environment:
    Arc/Info version 6.1.1, SunOS version 4.1.3
    Pathname = /montana/land/landuse

Data_Quality_Information:

Attribute_Accuracy_Report:
    Unknown. Plots of the data were checked against the orginal map by the USGS Water Resources Division and reviewed by

Spatial_Data_Organization_Information:

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Direct_Spatial_Reference_Method:  Vector
Point_and_Vector_Object_Information
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  Number of Polygons:  252
  Number of Polygon Labels:  251
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Spatial_Reference_Information:

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    Latitude_of_Projection_Origin:  44.25
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    False_Northing:  0
  Planar_Distance_Units:  meters
  Geodetic_Model
    Horizontal_Datum_Name:  North American Datum of 1983
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    Attribute_Definition:  Area of polygon
      Range_Domain
        Range_Domain_Minimum:  1591
        Range_Domain_Maximum:  10747145216
    Attribute_Units_of_Measure:  Square METERS
    Beginning_Date_of_Attribute_Values:  09/22/1993

  Attribute_Label:  LUC
    Attribute_Definition:  Land Use Code
    Enumerated_Domain_Value   Enumerated_Domain_Value_Definition
    -----------------------   ----------------------------------
      1                       Mostly Cropland
      2                       Cropland with Grazing Land
      4                       Irrigated Land
      5                       Woodland and forest with some cropland and pasture
      6                       Forest and woodland mostly grazed
      7                       Forest and woodland mostly ungrazed
      8                       Subhumid grassland and semiarid grazing land
      9                       Open woodland grazed (juniper, aspen, brush)
      10                      Desert shrubland grazed
      16                      Urban Areas
      17                      Open Water
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    Ending_Date_of_Attribute_Values:    01/01/1967

  Attribute_Label:  DESC
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Montana State Library
GIS Data Dictionary

Highways
Fig 4A, 4B

Metadata for Montana Highways, from 1:100,000 scale TIGER data

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Full FGDC-compliant Metadata

GIF **Browse Graphic**

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  Publication_Date:    04/28/1993
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  Online_Linkage:  http://nris.state.mt.us/nsdi/nris/shape/rd16.zip
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      Montana highways, selected by the Montana State Library from
      US Census Bureau 1:100,000 scale TIGER files.
  Purpose:
      Base map data.
Time_Period_of_Content
  Calendar_Date:  01/01/1990
Access_Constraints:
      None
Use_Constraints:
      Not for use at scales greater than 1:100000.
Native_Data_Set_Environment:
    Arc/Info version 6.1.1, SunOS version 4.1.3
    Pathname = /montana/highway
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Data_Quality_Information:

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Attribute_Accuracy_Report:
      Route names are correct.  Accuracy of length attributes is
      unknown.
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Horizontal_Datum_Name:  North American Datum of 1983
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Entity_and_Attribute_Information:

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Entity_Type_Definition:  Arc Attribute Table
  Attribute_Label:  NAME
    Attribute_Definition:  Route Name
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        93), "MT200" (Montana 200), and "S274" (Secondary 274).
        If more than one route follows an arc, there will be several
        names separated by spaces.
      Unrepresentable_Domain:  Character field
    Beginning_Date_of_Attribute_Values:  04/28/1993

  Attribute_Label:  MILES
    Attribute_Definition:  Arc length, miles
      Range_Domain
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        Range_Domain_Maximum:  88
    Attribute_Units_of_Measure:  miles
    Beginning_Date_of_Attribute_Values:  04/28/1993

  Attribute_Label:  TYPE
    Attribute_Definition:  Route type
        Route type of the hightest class of route that follows the
        arc.
    Enumerated_Domain_Value   Enumerated_Domain_Value_Definition
    -----------------------   ----------------------------------
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      Montana Ro              State Route
      Secondary               Secondary Route
      Interstate              Interstate Route
    Beginning_Date_of_Attribute_Values:  04/28/1993
```

Distribution_Information:

Metadata_Reference_Information:

```
Metadata_Date:  04/28/1993
Metadata_Review_Date:  10/07/1996
Metadata_Contact:  Gerry Daumiller
```

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```
      Unknown
Completeness_Report:
      Unknown
Horizontal_Positional_Accuracy_Report:
      The approximate accuracy of 1:250,000 scale maps is 130
      meters.
Vertical_Positional_Accuracy_Report:
      NONE
Lineage
  Source_Information
    Originator:  National Mapping Division
                 U.S. Geological Survey
    Publication_Date:  01/01/1953
    Title:  1:250,000-scale quadrangles
    Publication_Information
      Publication_Place:  Reston, VA
      Publisher:  U.S. Geological Survey
    Source_Scale_Denominator:  250000
    Type_of_Source_Media:  paper
    Source_Time_Period_of_Content
      Beginning_Date:  01/01/1953
      Ending_Date:     01/01/1975
    Source_Citation_Abbreviation:  Q250
    Source_Contribution:
        The data set was digitized from these maps.
  Source_Information
    Originator:  Montana Department of Community Affairs
    Publication_Date:  Unpublished material
    Title:  Montana Features File
    Other_Citation_Details:
      Exact date when this file was digitized is unknown.
    Source_Scale_Denominator:  250000
    Type_of_Source_Media:  electronic file
    Source_Time_Period_of_Content
      Calendar_Date:  01/01/1975
    Source_Citation_Abbreviation:  mff
    Source_Contribution:
        The data set was converted to Arc/Info and selected from
        this file.
Process_Step
  Process_Description:
    Select the railroad information from the Montana Features
    File and convert the data to Arc/Info format.
  Source_Used_Citation_Abbreviation:  mff
  Process_Date:  02/05/1991
  Source_Produced_Citation_Abbreviation:  fin
```

Spatial_Data_Organization_Information:

```
Direct_Spatial_Reference_Method:  Vector
Point_and_Vector_Object_Information
  Number of Arcs:  275
```

Spatial_Reference_Information:

```
Horizontal_Coordinate_System_Definition
Grid_Coordinate_System_Name: State Plane Coordinate System
```

Montana State Library
GIS Data Dictionary

FIG 4A, HB
SECTIONS LINES & HS

Metadata for Montana Public Land Survey Lines from 1:100,000 scale BLM maps.

Table of Contents

Identification_Information:

```
Citation
  Originator:        Montana State Library
  Publication_Date:  03/24/1996
  Title:             Montana Public Land Survey Lines from 1:100,000 scale BLM m
  Online_Linkage: http://nris.state.mt.us/nsdi/nris/ab106/plsse.html
  Online_Linkage: http://nris.state.mt.us/nsdi/nris/ab106/plsss.html
Description
  Abstract:
      Townships, Ranges, and Sections in Montana, including
      section lines "protracted" through unsurveyed areas by
      the BLM or Forest Service.
  Purpose:
      For display of Public Land Survey and for location of
      features whose legal descriptions are known.
Time_Period_of_Content
  Beginning_Date:  01/01/1975
  Ending_Date:     01/01/1993
Access_Constraints:
      None
Use_Constraints:
      Not for use at scales greater than 1:100000.  Not for
      accurate determination of section corner or property line
      locations.
Native_Data_Set_Environment:
    Arc/Info version 6.1.1, SunOS version 4.1.3
    Pathname = blm.plss
```

Data_Quality_Information:

```
Attribute_Accuracy_Report:
      Township and Range numbers were checked and corrected at
```

```
    Process_Date:  03/21/1996
    Source_Produced_Citation_Abbreviation:  s3
  Process_Step
    Process_Description:
      Add polygon attributes to BLM coverages that had no polygon
      attributes or no PCODE files.
    Source_Used_Citation_Abbreviation:  blmd
    Process_Date:  03/21/1996
    Source_Produced_Citation_Abbreviation:  s4
  Process_Step
    Process_Description:
      View township, range, and section attributes of every
      coverage and correct errors.  The AML for all the processing
      steps at the State Library is /usr4/blm/imp_plss.aml.  A
      list of all changes made at the Library is /usr4/blm/README.
    Source_Used_Citation_Abbreviation:  s3
    Source_Used_Citation_Abbreviation:  s4
    Process_Date:  03/21/1996
    Source_Produced_Citation_Abbreviation:  fin
```

Spatial_Data_Organization_Information:

```
  Direct_Spatial_Reference_Method:  Vector
  Point_and_Vector_Object_Information
    Number of Arcs:  347488
    Number of Polygons:  159335
    Number of Polygon Labels:  160867
```

Spatial_Reference_Information:

```
  Horizontal_Coordinate_System_Definition
  Grid_Coordinate_System_Name: State Plane Coordinate System
    SPCS_Zone_Identifier: 2500
    Map_Projection_Name:  Lambert Conformal Conic
      Standard_Parallel:  45
      Standard_Parallel:  49
      Longitude_of_Central_Meridian:  -109.5
      Latitude_of_Projection_Origin:  44.25
      False_Easting:   600000
      False_Northing:  0
    Planar_Distance_Units:  meters
    Geodetic_Model
      Horizontal_Datum_Name:  North American Datum of 1983
```

Entity_and_Attribute_Information:

```
  Entity_Type_Definition:  Arc Attribute Table
    Attribute_Label:  TYPE
      Attribute_Definition:  Code for Land Survey Line Type
      Enumerated_Domain_Value   Enumerated_Domain_Value_Definition
      -----------------------   ----------------------------------
        0                       Map Edge
        1                       Section Line
        2                       State Line
```

Metadata_Reference_Information:

```
Metadata_Date:  05/18/1996
Metadata_Contact:  Gerry Daumiller
```

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```
      Unknown
Completeness_Report:
      Unknown
Horizontal_Positional_Accuracy_Report:
      Unknown
Lineage
  Source_Information
    Originator:  U.S. Bureau of Mines
                 Branch of Engineering and Economic Analysis
    Publication_Date:  09/01/1992
    Title:  Mineral Information System
    Publication_Information
      Publication_Place:  Spokane, WA
      Publisher:  U.S. Bureau of Mines
    Other_Citation_Details:
      East 360 3rd Avenue
      509-353-2735
    Source_Scale_Denominator:  0
    Type_of_Source_Media:  Electronic file
    Source_Time_Period_of_Content
      Calendar_Date:  09/01/1992
    Source_Citation_Abbreviation:  s1
    Source_Contribution:
        The data set is a copy of this source.
Process_Step
  Process_Description:
    Project the Bureau of Mines data to Albers.
  Source_Used_Citation_Abbreviation:  s1
  Process_Date:  10/06/1992
  Source_Produced_Citation_Abbreviation:  fin
```

Spatial_Data_Organization_Information:

```
Direct_Spatial_Reference_Method:  Point
Point_and_Vector_Object_Information
  Number of Points:  7481
```

Spatial_Reference_Information:

```
Horizontal_Coordinate_System_Definition
Grid_Coordinate_System_Name: State Plane Coordinate System
  SPCS_Zone_Identifier: 2500
  Map_Projection_Name:  Lambert Conformal Conic
    Standard_Parallel:  45
    Standard_Parallel:  49
    Longitude_of_Central_Meridian:  -109.5
    Latitude_of_Projection_Origin:  44.25
    False_Easting:   600000
    False_Northing:  0
  Planar_Distance_Units:  meters
  Geodetic_Model
    Horizontal_Datum_Name:  North American Datum of 1983
```

Entity_and_Attribute_Information:

```
    Attribute_Definition:  Seconds of Latitude
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  59
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  DLONG
    Attribute_Definition:  Degrees of Longitude
      Range_Domain
        Range_Domain_Minimum:  104
        Range_Domain_Maximum:  117
    Attribute_Measurement_Resolution:  1
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  MLONG
    Attribute_Definition:  Minutes of Longitude
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  59
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  SLONG
    Attribute_Definition:  Seconds of Longitude
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  59
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  UTMZ
    Attribute_Definition:  UTM coordinate zone
      Range_Domain
        Range_Domain_Minimum:  11
        Range_Domain_Maximum:  13
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  UTMN
    Attribute_Definition:  UTM northing
      Range_Domain
        Range_Domain_Minimum:  4920699
        Range_Domain_Maximum:  5428180
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  UTME
    Attribute_Definition:  UTM easting
      Range_Domain
        Range_Domain_Minimum:  267358
        Range_Domain_Maximum:  732812
    Attribute_Measurement_Resolution:  1
    Beginning_Date_of_Attribute_Values:  09/01/1992

  Attribute_Label:  PREC
    Attribute_Definition:  Precision of coordinates
    Enumerated_Domain_Value   Enumerated_Domain_Value_Definition
    -----------------------   ----------------------------------
      100M                    100 meters
      10M                     10 meters
      500M                    500 meters
      UNK                     Unknown
      1KM                     1000 meters
      1000                    1000 meters?
      10                      10 meters?
      5KM                     5000 meters
```

```
  Enumerated_Domain_Value   Enumerated_Domain_Value_Definition
  -----------------------   ----------------------------------
    R                       Resource data is available
    C                       Complete data is available
    M                       Not confirmed
    L                       Location is confirmed
  Beginning_Date_of_Attribute_Values:  09/01/1992

Attribute_Label:  YR-CHKD
  Attribute_Definition:  Year checked
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  1992
  Beginning_Date_of_Attribute_Values:  09/01/1992

Attribute_Label:  EVALUATOR
  Attribute_Definition:  Checked by
    Unrepresentable_Domain:  Character field
  Beginning_Date_of_Attribute_Values:  09/01/1992

Attribute_Label:  PROP-FILE
  Attribute_Definition:  US BOM backup file number
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  100
  Beginning_Date_of_Attribute_Values:  09/01/1992

Attribute_Label:  LAST-MOD
  Attribute_Definition:  Date last modified
    Unrepresentable_Domain:  Character field
  Beginning_Date_of_Attribute_Values:  09/01/1992

Attribute_Label:  COM
  Attribute_Definition:  List of up to 5 commodities mined
    Unrepresentable_Domain:  Character field
  Beginning_Date_of_Attribute_Values:  09/01/1992
```

Distribution_Information:

Metadata_Reference_Information:

```
Metadata_Date:  07/02/1993
Metadata_Review_Date:  10/05/1996
Metadata_Contact:  Gerry Daumiller
```

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```
Attribute_Accuracy_Report:
      Unknown
Completeness_Report:
      The coverage is a complete summary of the reports provided
      by the Solid & Hazardous Waste Bureau.
Horizontal_Positional_Accuracy_Report:
      Unknown -- Data is aggregated to cities based on mailing
      addresses of the reporting organizations, but the possible
      distance between where the waste was produced and the center
      of a city is unknown.
Lineage
  Source_Information
    Originator:  Montana Solid and Hazardous Waste Bureau
                 Department of Health and Environmental Sciences
    Publication_Date:  04/01/1993
    Title:  Solid & Hazardous Waste Bureau Annual Reports, 1986-92
    Publication_Information
      Publication_Place:  Helena, MT
      Publisher:  Montana Solid and Hazardous Waste Bureau
    Other_Citation_Details:
      836 Front Street, Box 200901
      404-444-1430
    Source_Scale_Denominator:  0
    Type_of_Source_Media:  electronic database
    Source_Time_Period_of_Content
      Calendar_Date:  04/01/1993
    Source_Citation_Abbreviation:  s1
    Source_Contribution:
        The amount of waste produced in each town was summarized
        from these reports.
  Source_Information
    Originator:  National Mapping Division
                 U.S. Geological Survey
    Publication_Date:  01/01/1992
    Title:  Geographic Names Information System - 1992
    Edition:  1992
    Publication_Information
      Publication_Place:  Denver, CO
      Publisher:  National Mapping Division
    Other_Citation_Details:
      Denver Federal Center
      303-234-2326
    Source_Scale_Denominator:  24000
    Type_of_Source_Media:  electronic file
    Source_Time_Period_of_Content
      Calendar_Date:  01/01/1992
    Source_Citation_Abbreviation:  gnis
    Source_Contribution:
        The coordinates of the cities came from this source.
 Process_Step
   Process_Description:
     Summarize the Hazardous Waste report by city.  This was
     done with /gis2/montwork/cmp/94/94nris52a.aml, but the
     original report data is lost.  The aml would probably work
     with the /gis2/montwork/hazwaste2 coverage.
   Source_Used_Citation_Abbreviation:  s1
   Source_Used_Citation_Abbreviation:  gnis
   Process_Date:  09/07/1993
   Source_Produced_Citation_Abbreviation:  fin
```

```
    Attribute_Definition:  total waste,1988
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  25804.16992187
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  T89
    Attribute_Definition:  total waste,1989
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  2914.120117187
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  T90
    Attribute_Definition:  total waste,1990
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  6313.33984375
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  T91
    Attribute_Definition:  total waste,1991
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  4145.569824218
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  T92
    Attribute_Definition:  total waste, 1992
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  7771.959960937
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  TD0
    Attribute_Definition:  toxic waste, 1986-92
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  6450.990234375
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  TD1
    Attribute_Definition:  flammable waste, 1986-92
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  211.0200042724
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  TD2
    Attribute_Definition:  corrosive waste, 1986-92
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  1972.359985351
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993
```

```
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D088T
    Attribute_Definition:  toxic waste, 1988
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  509.9300231933
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D089T
    Attribute_Definition:  toxic waste, 1989
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  950.200012207
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D090T
    Attribute_Definition:  toxic waste, 1990
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  2967.060058593
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D091T
    Attribute_Definition:  toxic waste, 1991
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  715.7899780273
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D092T
    Attribute_Definition:  toxic waste, 1992
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  2181.25
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D186T
    Attribute_Definition:  flammable waste, 1986
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  33.63000106811
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D187T
    Attribute_Definition:  flammable waste, 1987
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  7.799999713897
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D188T
    Attribute_Definition:  flammable waste, 1988
      Range_Domain
```

```
    Attribute_Definition:  corrosive waste, 1989
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  647.950012207
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D290T
    Attribute_Definition:  corrosive waste, 1990
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  24.62000083923
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D291T
    Attribute_Definition:  corrosive waste, 1991
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  1322.729980468
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D292T
    Attribute_Definition:  corrosive waste, 1992
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  28.15999984741
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D386T
    Attribute_Definition:  reactive waste, 1986
      Unrepresentable_Domain:  Character field
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D387T
    Attribute_Definition:  reactive waste, 1987
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  0.0099999997764
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D388T
    Attribute_Definition:  reactive waste, 1988
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  31
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D389T
    Attribute_Definition:  reactive waste, 1989
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  21
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  D390T
```

```
Attribute_Label:  F091T
  Attribute_Definition:  non-specific sources, 1991
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  998.8499755859
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  F092T
  Attribute_Definition:  non-specific sources, 1992
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  1562.479980468
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K086T
  Attribute_Definition:  specific industrial sources, 1986
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  18000
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K087T
  Attribute_Definition:  specific industrial sources, 1987
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  3445.600097656
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K088T
  Attribute_Definition:  specific industrial sources, 1988
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  25804.16992187
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K089T
  Attribute_Definition:  specific industrial sources, 1989
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  2856.760009765
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K090T
  Attribute_Definition:  specific industrial sources, 1990
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  2772.199951171
  Attribute_Units_of_Measure:  Tons
  Beginning_Date_of_Attribute_Values:  09/07/1993

Attribute_Label:  K091T
  Attribute_Definition:  specific industrial sources, 1991
    Range_Domain
      Range_Domain_Minimum:  0
      Range_Domain_Maximum:  4129.299804687
```

```
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  3009.84008789
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P086T
    Attribute_Definition:  acutely hazardous chemicals, 1986
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  5.670000076294
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P087T
    Attribute_Definition:  acutely hazardous chemicals, 1987
      Unrepresentable_Domain:  Character field
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P088T
    Attribute_Definition:  acutely hazardous chemicals, 1988
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  0.2000000029802
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P089T
    Attribute_Definition:  acutely hazardous chemicals, 1989
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  7.75
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P090T
    Attribute_Definition:  acutely hazardous chemicals, 1990
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  2.41000008583
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P091T
    Attribute_Definition:  acutely hazardous chemicals, 1991
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  1.110000014305
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  P092T
    Attribute_Definition:  acutely hazardous chemicals, 1992
      Range_Domain
        Range_Domain_Minimum:  0
        Range_Domain_Maximum:  1.360000014305
    Attribute_Units_of_Measure:  Tons
    Beginning_Date_of_Attribute_Values:  09/07/1993

  Attribute_Label:  U086T
    Attribute_Definition:  non-acutely hazardous chemicals, 86
      Range_Domain
```

Metadata_Reference_Information:

```
Metadata_Date:  09/15/1993
Metadata_Review_Date:  02/06/1997
Metadata_Contact:  Gerry Daumiller
```

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State of Montana
Environmental Program
PO Box 4789

City: Helena

State_or_Province: MT

Postal_Code: 59604

Contact_Voice_Telephone: (406) 444-7943

<hr>

GIS Department
Colorado State University

City: Ft. Collins

State_or_Province: CO

Postal_Code: 80523

Contact_Voice_Telephone: (970) 491-0676

<hr>

Department of Military Affairs
State of Montana
Environmental Program
PO Box 4789

City: Helena

State_or_Province: MT

Postal_Code: 59604

Contact_Voice_Telephone: (406) 444-7943

<hr>

Department of Military Affairs
State of Montana
Environmental Program
PO Box 4789

City: Helena

State_or_Province: MT

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Colorado State University

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GIS Department
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<br>
Address:  Jessica Carter
      Concurrent Technologies Corporation
      1450 Scalp Avenue
<br>
City:  Johnstown
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State_or_Province:  PA
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Postal_Code:  15904
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Contact_Voice_Telephone:  (814) 269-2711
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Contact_Organization: Bureau of Land Management (BLM)/District Office

Address_Type: mailing address

Address: Jan Snyder, Bureau of Land Management (BLM)/District Office, 106 North Parkmont

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State_or_Province: MT

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Appendix B

Army National Guard Equipment Description Fact Sheets

8.0 ATTACHMENTS

8.1 M1/M1A1 ABRAMS TANK

MISSION

The Abrams Tank is the Army's primary ground combat weapon system for closing with and destroying enemy forces using firepower, mobility, and shock action. This is accomplished in coordination with other ground and air systems under all battlefield conditions and levels of combat intensity. The Abrams special armor, compartmentalization of fuel and maingun ammunition which is stored away from the crew, together with an automatic fire detection and suppression system make it less vulnerable and more survivable on the modern battlefield. Its improved day/night fire control and shoot-on-the-move capability assure its ability to deliver highly accurate and lethal fires on both armored and unprotected targets. The 1500-horsepower turbine engine and improved suspension system permit the tank to move quickly across the battlefield, while reducing the tank's exposure to threat weapons.

CHARACTERISTICS

	M1	M1A1
Length:	384.5 inches	387.0 inches
Width:	143.8 inches	Same
Height:	93.5 inches	Same
Weight:	60.0 tons	63 tons
Top Speed:	45 mph	41.5 mph
Crew:	4	Same
Main Gun:	105mm	120mm

	M1 and M1A1
Secondary Armament:	One .50 cal machinegun
Armament:	Two 7.62mm machineguns
Power Train:	1500 hp gas turbine engine w/4 speed automatic transmission
Cruising Range:	275 miles at 29 mph
Fire Control:	Thermal Imaging Sight; Laser Rangefinder; Digital Computer

SOVIET COUNTERPART

Over the past decade, the Soviets have conducted an intensive armor modernization effort and have fielded several thousand T-64's and T-72's with enhanced armor protection and firepower. In addition, they are fielding the new T-80 tank which will probably be capable of launching an ATGM (Anti-tank Guided Missile) through the main gun tube.

PROGRAM STATUS

The M1 is now in its sixth year of procurement with over 3,000 produced at the end of FY 1985. Fielding began in 1981 and will continue into the early 1990's. Twenty-three battalions were fielded at the end of FY 1985.

Abrams

Overmatch Capabilities

MISSION: The Abrams tank provides heavy armor superiority on the battlefield.

CHARACTERISTICS: The Abrams tank closes with and destroys enemy forces on the integrated battlefield using mobility, firepower, and shock effect. The 105 mm main gun on the M1 and IPM1 and the 120 mm main gun on the M1A1 and M1A2, combined with the powerful 1,500 hp turbine engine and special armor, make the Abrams tank particularly suitable for attacking or defending against large concentrations of heavy armor forces on a highly lethal battlefield. Additional features of the M1A1 are increased armor protection, suspension improvements, and an NBC protection system that increases survivability in a contaminated environment. The M1A2 program provides the Abrams tank with the necessary improvements in lethality, survivability, and fightability required to defeat advanced threats. The M1A2 includes a Commander's Independent Thermal Viewer, an Improved Commander's Weapon Station, position navigation equipment, a distributed data and power architecture, embedded diagnostic system, improved fire control system, and a radio interface unit that allows, through the SINCGARS radio, rapid transfer of digital situational data and overlays to compatible systems on the digital battlefield.

	M1/IPM1	M1A1	M1A2
Length:	32.04 ft	32.25 ft	32.25 ft
Width:	12.0 ft	12.0 ft	12.0 ft
Height:	7.79 ft	8.0 ft	8.0 ft
Top speed:	45.0/41.5 mph	41.5 mph	41.5 mph
Weight:	61.4/62.8 tons	67.6 tons	68.4 tons
Armament:	105 mm	120 mm	120 mm
Crew:	4	4	4

FOREIGN COUNTERPART:

France: Leclere

Germany: Leopard 2

Israel: Merkava Mk. 3

Italy: C1 Ariete

Russia: T-64, T-72, and T-80

United Kingdom: Challenger 2

FOREIGN MILITARY SALES:

Egypt: 555 M1A1 Kits

Kuwait: 218 M1A2s

Saudia Arabia: 315 M1A2s

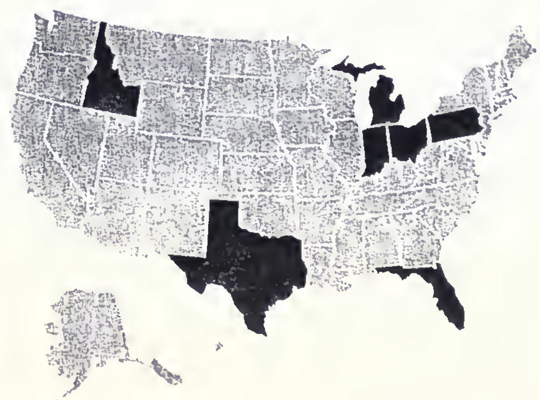
PROGRAM STATUS: Production of new Abrams for the U.S. Army and current Foreign Military Sales cases is complete (except for M1A1 tanks kits for Egypt). In lieu of new production, the Army is upgrading approximately 1,000 older M1 tanks to the M1A2 configuration. A multiyear procurement for 600 M1A2 upgrades was awarded in July 1996. Further M1A2 improvements, called the System Enhancement Program (SEP), are underway to enhance the tanks digital command and control capabilities and to add second generation forward looking infrared (FLIR) sensors to the thermal sights to improve the tank's fightability and lethality.

PROJECTED ACTIVITIES:

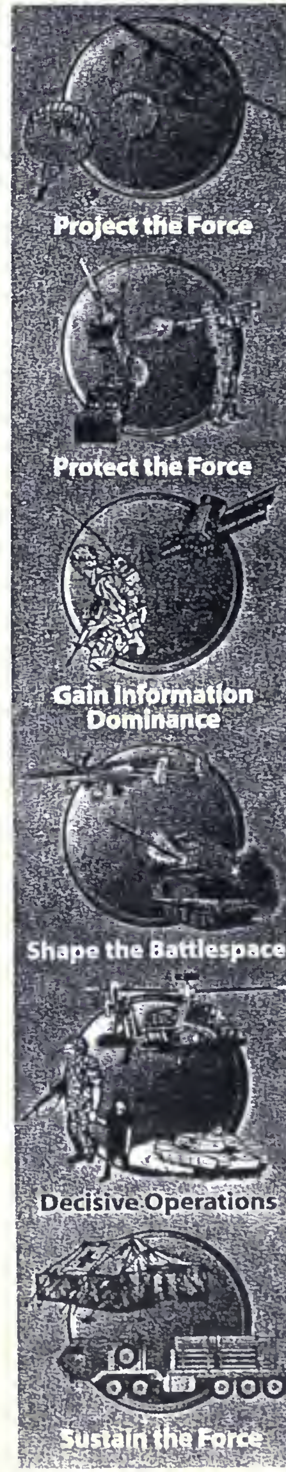
- The initial M1A2 fielding to the First Cavalry Division, Ft. Hood, TX is underway with completion scheduled for June 1998.
- The first M1A2 SEP tanks are scheduled to begin fielding in 3QFY00.

PRIME CONTRACTOR(S):

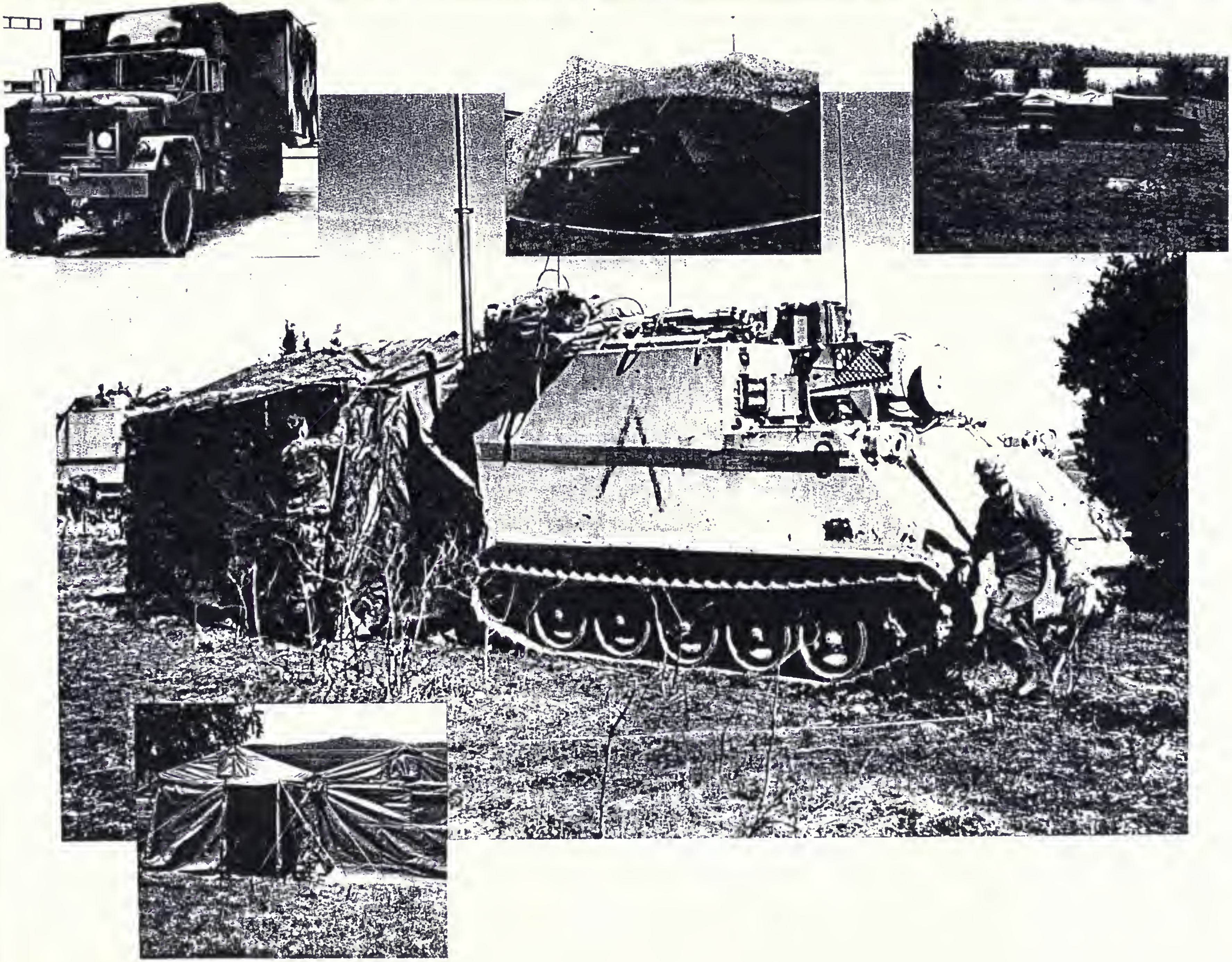
General Dynamics (Land Systems Division)
(Sterling Heights, MI; Warren, MI; Muskegon, MI; Scranton, PA; Lima, OH; Tallahasee, FL)



•See appendix for list of subcontractors



Standardized Integrated Command Post (SICPS)



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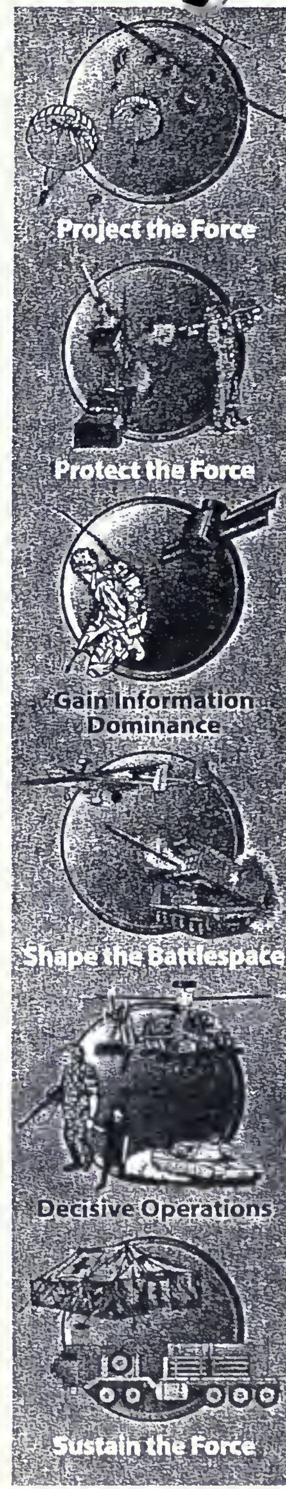
vermatch Capabilities



MISSION: The Standardized Integrated Command Post System (SICPS) is a family of standard command post (CP) facilities developed to house the Army Battle Command System across all Battlefield Functional Areas (BFA). Variants of SICPS consist of a Tent CP, a Rigid Wall Shelter CP, a Track Vehicle CP (M1068), a 5 Ton Expansible Van CP, and a Soft Top HMMWV CP.

CHARACTERISTICS: Tent CP: 11 ft by 11 ft supported by a three-piece aluminum frame, with interchangeable fabric sidewalls, any of which can be removed for attaching two or more tents together. Fielded with two tables, mapboards, and a fluorescent light set. The Tent CP can be attached to any of the other SICPS variants, except the 5 Ton Expansible Van CP, by replacing one sidewall with an interface boot wall.

Rigid Wall Shelter CP: Mounts on the HMMWV shelter carrier (M1097) and is powered by an on-board 10 kW generator. Provides equipment racks, internal lighting and blackout, power and signal import/export panels, internal wiring/cabling, vehicular intercom system, 18000 BTU environmental control unit, chemical/biological protection, electromagnetic interference shielding, Quick Erect Antenna Mast (QEAM), and workspace for two each Command, Control, Communications, Computers and Intelligence (C4I) workstations and operators.

Track Vehicle CP: Modification of existing M577 track vehicle to M1068 CP vehicle by addition of on-board 5 kW generator, equipment racks, internal lighting, power and signal import/export panels, internal wiring/cabling, vehicular intercom system, QEAM, and workspace for two each C4I workstations and operators.

5 Ton Expansible Van CP: An installation kit, M-2780/G, for existing 5 Ton Expansible Van (M934A2) which provides equipment racks, internal lighting and blackout, power and signal import/export panels, internal wiring/cabling, QEAM, and workspace for four each moveable C4I workstations and operators.

Soft Top HMMWV CP: An installation kit, M-2727/G, for existing HMMWV that provides equipment racks, internal lighting and blackout, power and signal import/export modules, internal wiring/cabling, mount for QEAM, and workspace for two each C41 workstations and operators.

FOREIGN COUNTERPART: No known foreign counterpart.

FOREIGN MILITARY SALES: No foreign military sales.

PROGRAM STATUS:

Tent CP: Type Classified (TC) Standard, February 1990; production contract, August 1991. On-going fielding.

RWS CP: Version 1, TC limited Procurement Urgent, August 1991. Production contract, September 1991; 251 fielded. Version 4, Milestone III, August 1996. Start production: October 1996. First deliveries: February 1998.

Track CP: Production contract awarded, June 1992. TC Standard, September 1995. On-going fielding.

5 Ton Expansible Van CP: Milestone III, August 1996. Start production September 1996. First delivery: January 1998.

Soft Top HMMWV CP: Production contract, June 1995; TC Standard, October 1995. First delivery: August 1996.

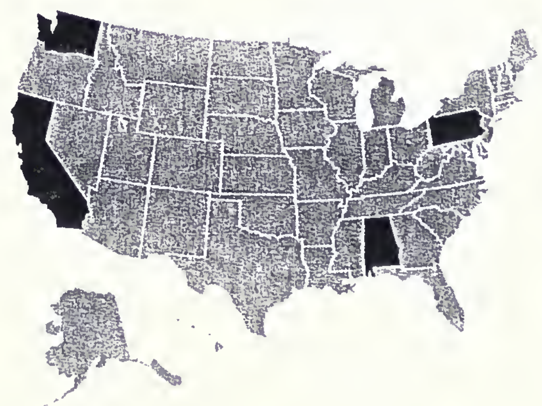
PROJECTED ACTIVITIES:

Continue to procure systems required by Army Battle Command Battlefield Functional Area Systems.

PRIME CONTRACTOR(S):

Systems Support: RDA (Tacoma, WA)

M1068 Installation Kits: FMC (United Defense LP), (San Jose, CA)



•See appendix for list of subcontractors

HIGH MOBILITY MULTI-PURPOSE WHEELED VEHICLE (HMMWV)

(The Marine Corps designates this vehicle as M-998 Truck)

SERVICES: Army and Marine Corps

DESCRIPTION:
In the 1980s, the HMMWV replaced the famed Jeep as the Army's basic utility vehicle. Generally, it is the workhorse of the wheeled vehicle fleet. It is used as a weapons carrier to tow light howitzers or carry mortars. Variants of the "Humvee" are also used as ambulances, military police tactical vehicles and for battlefield reconnaissance. The HMMWV has a cargo capacity of 1¼ to 2¼ tons, depending on the configuration. It is a highly mobile tactical vehicle with a common chassis for various configurations, including: Cargo/troop carrier, armament carrier, TOW missile carrier, ambulance and shelter carrier.

BACKGROUND:
The Army received the HMMWV in 1985. At the end of FY 93, the Army will have 89,486 HMMWVs. There are 19,598 HMMWVs in the Marine Corps inventory. The average unit cost of the HMMWV (based upon an average of all configurations) is $31,571.

POINT OF CONTACT:
Army: Army Public Affairs, (703) 697-7589; **Marine Corps:** Headquarters, U.S. Marine Corps Division of Public Affairs, (703) 614-1492

GENERAL CHARACTERISTICS

Primary function:	General purpose vehicle
Contractor:	AM General Corp., South Bend, Ind.
Weight:	7,700 to 10,000 pounds (3,465 to 4,500 kg) depending on configuration
Length:	180 to 203 inches (4.55 to 5.1 meters)
Height:	72 to 105 inches (2 to 2.7 meters)
Width:	85 inches (2.1 meters)
Range:	300 miles (480 km)
Power train:	150 horsepower 6.2-liter diesel engine, three-speed automatic transmission, 4-wheel drive
Crew:	Driver plus three passengers
Armor:	None
Road speed:	60 mph (96 kmph)
Armament:	Can be equipped with a .50-caliber machine gun, a Mark 19-3 40mm Grenade Launcher, a 7.62mm machine gun, Stinger anti-aircraft or TOW antitank missiles.

M-109A3 155mm SELF-PROPELLED HOWITZER

SERVICE: Marine Corps

DESCRIPTION:
The M-109A3 is an armored self-propelled medium howitzer firing a 155mm (about 6.2 inch diameter) shell. It is used to provide indirect fire support.

FEATURES:
The 155mm M-109A3 can be transported by C-5 aircraft. It has an amphibious capability when equipped with a flotation kit. Components of the weapon include a periscope, cannon, firing mechanism, howitzer cannon, elbow telescope and panoramic telescope.

BACKGROUND:
The M-109A3 has been in the Marine Corps inventory since the mid-1970s. All 36 howitzers are in the Reserves inventory.

POINT OF CONTACT:
Headquarters, U.S. Marine Corps, Division of Public Affairs, Washington, DC 20380-1775; (703) 614-1492.

GENERAL CHARACTERISTICS

Primary function:	Provides artillery support for armored and mechanized infantry forces.
Contractor:	ARRCOM (Turret); TACOM (Chassis); CECOM (Communications)
Unit cost:	$958,956
Power plant:	8V71T Detroit Diesel Engine
Power train:	XTG-411-2A Allison
Length:	29.66 feet (9.04 meters)
Width:	10.75 feet (3.27 meters)
Height:	9.17 feet (2.79 meters)
Weight:	53,060 pounds (24,089 kg)
Weight fully armed:	55,000 pounds (24,970 kg)
Bore diameter:	155mm (6.2 inches)
Maximum effective range:	14.5 miles (23.5 km) (with rocket-assisted projectile)
Rate of fire:	Maximum:4 rounds per minute for 3 minutes Sustained:1 round per minute
Travel Range:	220 miles (354.2 km) at cruising speed
Speed:	35 miles (56.32 km) per hour, maximum
Crew:	6 enlisted
Armament:	Main:M-185 155mm cannon Secondary: M-2 .50 caliber machine gun

DEPARTMENT OF DEFENSE
THE UNITED STATES **FACT FILE**

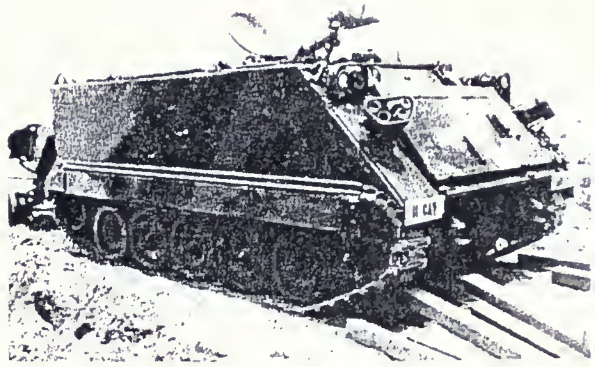
M-113A2 ARMORED PERSONNEL CARRIER

SERVICE: Army

DESCRIPTION: Armored, tracked vehicle used to transport troops

FEATURES:
The M-113A2 personnel carrier is a lightly armored, full-tracked combat vehicle that provides protected transportation for troops or cargo in combat. The A2 model features improvements in the cooling, suspension and personnel heating systems. The vehicle can carry up to 12 combat-equipped troops or a payload of two tons.

BACKGROUND:
The M-113 entered production in 1959 and ended production in 1992. More than 80,000 M-113 vehicles have been produced in 40 different variants and in use by more than 50 countries. Substantial mobility improvements are being made through the conversion of the M-113A2 to the M-113A3. Improvements include engine and transmission upgrades, and improved suspension and armor.



POINT OF CONTACT: Army Public Affairs, (703) 697-7589

GENERAL CHARACTERISTICS:

Primary function:	Protected transportation of troops
Contractor:	FMC Corp., San Jose, Calif.
Weight (combat loaded):	24,986 pounds (11,243 kg)
Length:	15.9 feet (4.8 meters)
Height:	8.2 feet (2.5 meters)
Width:	8.8 feet (2.7 meters)
Range:	300 miles (480 kg)
Crew:	Two (track commander and driver)
Road Speed:	38 miles (60.8 km) per hour
Power train:	212 HP Detroit diesel
Armor:	Aluminum
Main Armament:	.50 cal machine gun

THE UNITED STATES DEPARTMENT OF DEFENSE

FACT FILE

M-120 / M-121 MORTAR

SERVICE: Army

DESCRIPTION:
A muzzle-loaded, 120mm (4.7 inch) mortar

FEATURES:
The 120mm Mortar is smoothbored, muzzle-loaded and provides indirect fire support, for light battalions, replacing the M-30, 4.2 inch (105mm) mortar. The M-120 is towed on a two-wheeled carriage and the M-121 is mounted on the M1064 Mortar Carrier.

BACKGROUND:
The 120mm Mortar was acquired from Israel. The Army received the M-120 mortar in 1991, and expects to put its first M-121s in the field in 1994. The Army presently has 63 M-120 mortars and expects to have 1,662 M-121 mortars in its inventory at the end of FY98.

POINT OF CONTACT:
Army Public Affairs, (703) 697-7989

GENERAL CHARACTERISTICS:

Primary function:	Mortar fire for armored, mechanized, and motorized battalions
Contractor:	Watervliet Arsenal, NY
Unit cost:	$136,000
Caliber:	120mm (4.72 inches)
Weight:	318 lbs (143.1 kg)
Crew:	Five (Towed); Four (Carrier)
Muzzle velocity:	Varies with projectile type and charge, typically about 1,000 feet (303.3 meters) per second
Sustained rate of fire:	Four rounds per minute
Maximum range:	7,240 meters (4.5 miles)
Lethality:	30 meter (100 feet) bursting radius for high explosive shell
Ammunition used:	High explosive, smoke, illumination

THE UNITED STATES DEPARTMENT OF DEFENSE

FACT FILE

M-88A1 RECOVERY VEHICLE

SERVICES: Army and Marine Corps

DESCRIPTION:
An armored vehicle used as a wrecker for disabled tanks

FEATURES:
The M-88A1 is an armor-protected recovery vehicle used to tow, winch, and lift disabled armored combat vehicles. The system is most effective in recovering vehicles of 60 tons (54 metric tons) or less. In addition to towing, the M-88A1 mounts a winch that can pull up to 45 tons (40.5 metric tons), and a boom capable of lifting up to 25 tons (22.5 metric tons). It is also used to support critical maintenance operations such as engine replacement of vehicles undergoing battlefield maintenance.

BACKGROUND:
The M-88A1 was introduced to the Army and the Marine Corps in 1977.

POINTS OF CONTACT:
Army: Army Public Affairs, (703)697-7589: **Marine Corps:** Headquarters, U.S. Marine Corps, Division of Public Affairs, (703) 614-1492.

GENERAL CHARACTERISTICS

Primary function:	Armored recovery vehicle
Contractor:	BMY Combat Systems, York, Pennsylvania
Weight:	112,000 lbs (50,858 kgms)
Length:	27.1 feet (8.27 meters)
Width:	11.25 feet (3.43 meters)
Height:	10.25 feet (3.12 meters)
Speed:	26 miles per hour (41.86 km per hour) without a towed load
Range:	300 miles (483 km)
Armament:	M-2 .50 caliber machine gun
Grade ascending:	60%
Inventory:	The Army has 2,458 M-88A1s in its inventory. The Marine Corps has 79.
Unit cost:	$1.2 million

DEPARTMENT OF DEFENSE

THE UNITED STATES

FACT FILE

TOW MISSILE

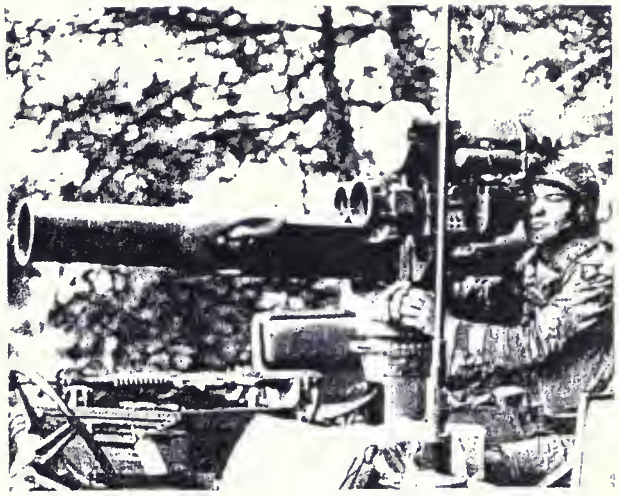
SERVICE: Army, Marine Corps

DESCRIPTION:
The Tube Launched, Optically Tracked, Wire-Guided (TOW) Weapon System is an anti-armor missile.

FEATURES:
The TOW system can track targets in poor visibility and all weather conditions. Once the missile is fired, the gunner need only keep his crosshairs on the target. Guidance of the missile to its target is controlled by a thin wire. A computer in the launcher corrects any deviation from the aim point on the target and sends corrections to the missile via wires that deploy in flight.

The system is composed of a reusable launcher, a missile guidance set and sight system. It can be mounted on a tripod.

BACKGROUND:
The basic TOW was fielded by the Army in 1970. The latest version is the TOW 2B, first issued in October 1992. This system is mounted on the Army's Bradley Fighting Vehicle, the Army's AH-1S Cobra Attack



Helicopter, the Marine Corps' Light Armored Vehicle (Anti-Tank and the High Mobility Multipurpose Wheeled Vehicle (Hum-vee). The Army has 101,446 TOWs in its inventory.

POINTS OF CONTACT:
Army: Army Public Affairs, (703) 697-7598; **Marine Corps:** Headquarters, U.S. Marine Corps, Division of Public Affairs, (703)614-1492

GENERAL CHARACTERISTICS

Primary Function:	Heavy Anti-tank Missile
Contractors:	Hughes Aircraft Corporation (Missile, Launcher and Night Sight); Kollsman (Night Sight); Electro-Design Manufacturing Inc. (TOW 2 Launcher)
Unit cost:	$20,800
Length:	46 inches (116.8 centimeters)
Diameter:	5.8 inches (14.9 centimeters)
Weight:	49.8 pounds (22.60 kilograms)
Maximum range:	2.33 miles (3.75 km)
Speed:	589 feet (178.5 meters) per second
Guidance:	Wire-guided from launcher by the gunner

577

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CHARACTERISTICS: Tent CP: 11 ft by 11 ft supported by a three-piece aluminum frame, with interchangeable fabric sidewalls, any of which can be removed for attaching two or more tents together. Fielded with two tables, mapboards, and a fluorescent light set. The Tent CP can be attached to any of the other SICPS variants, except the 5 Ton Expansible Van CP, by replacing one sidewall with an interface boot wall.

Rigid Wall Shelter CP: Mounts on the HMMWV shelter carrier (M1097) and is powered by an on-board 10 kW generator. Provides equipment racks, internal lighting and blackout, power and signal import/export panels, internal wiring/cabling, vehicular intercom system, 18000 BTU environmental control unit, chemical/biological protection, electromagnetic interference shielding, Quick Erect Antenna Mast (QEAM), and workspace for two each Command, Control, Communications, Computers and Intelligence (C4I) workstations and operators.

Track Vehicle CP: Modification of existing M577 track vehicle to M1068 CP vehicle by addition of on-board 5 kW generator, equipment racks, internal lighting, power and signal import/export panels, internal wiring/cabling, vehicular intercom system, QEAM, and workspace for two each C4I workstations and operators.

5 Ton Expansible Van CP: An installation kit, M-2780/G, for existing 5 Ton Expansible Van (M934A2) which provides equipment racks, internal lighting and blackout, power and signal import/export panels, internal wiring/cabling, QEAM, and workspace for four each moveable C4I workstations and operators.

Soft Top HMMWV CP: An installation kit, M-2727/G, for existing HMMWV that provides equipment racks, internal lighting and blackout, power and signal import/export modules, internal wiring/cabling, mount for QEAM, and workspace for two each C4I workstations and operators.

FOREIGN COUNTERPART: No known foreign counterpart.

FOREIGN MILITARY SALES: No foreign military sales.

PROGRAM STATUS:

Tent CP: Type Classified (TC) Standard, February 1990; production contract, August 1991. On-going fielding.

RWS CP: Version 1, TC limited Procurement Urgent, August 1991. Production contract, September 1991; 251 fielded. Version 4, Milestone III, August 1996. Start production: October 1996. First deliveries: February 1998.

Track CP: Production contract awarded, June 1992. TC Standard, September 1995. On-going fielding.

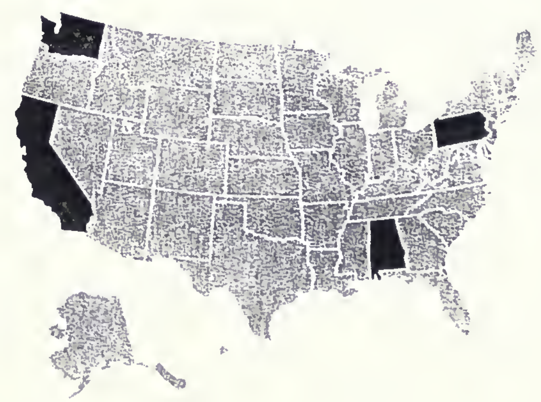
5 Ton Expansible Van CP: Milestone III, August 1996. Start production September 1996. First delivery: January 1998.

Soft Top HMMWV CP: Production contract, June 1995; TC Standard, October 1995. First delivery: August 1996.

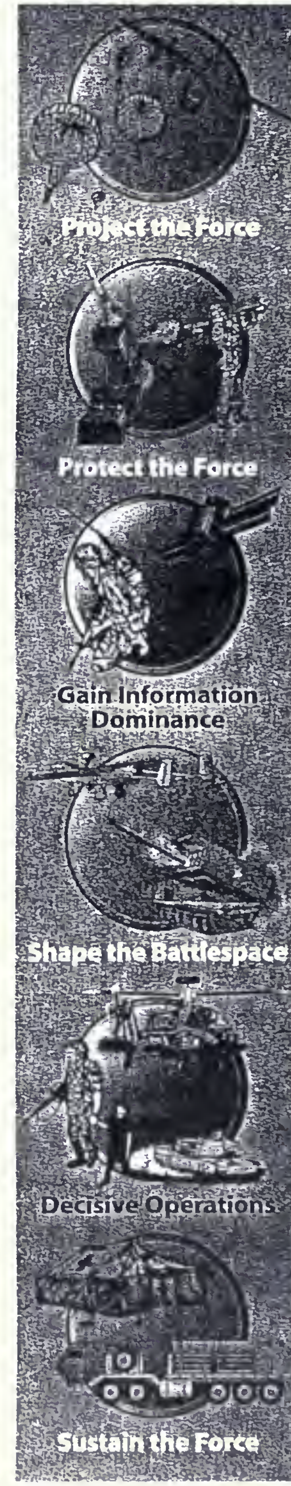
PROJECTED ACTIVITIES:
Continue to procure systems required by Army Battle Command Battlefield Functional Area Systems.

PRIME CONTRACTOR(S):
Systems Support: RDA (Tacoma, WA)

M1068 Installation Kits: FMC (United Defense LP), (San Jose, CA)



•See appendix for list of subcontractors



Appendix C

Observed Occurrences of Birds, Mammals and Reptiles in the Affected Environment

Appendix C. Wildlife species recorded by direct observation or by evidence, Fort Harrison and Limestone Hills areas, July - October, 1997.

Species	Ft. Harrison	Limestone Hills
BIRDS		
Turkey vulture (*Cathartes aura*)	X	
American kestrel (*Falco sparverius*)	X	X
Gray partridge (*Perdix perdix*)	X	
Killdeer (*Charadrius vociferus*)		X
Unidentified gull (*Larus* spp.)	X	
Rock dove (*Columba livia*)	X	X
Mourning dove (*Zenaida macroura*)	X	X
Common nighthawk (*Chordeiles minor*)	X	X
Northern flicker (*Colaptes auritus*)		X
Least flycatcher (*Empidonax minimus*)		X
Say's phoebe (*Sayornis saya*)		X
Western kingbird (*Tyrannus verticalis*)	X	
Eastern kingbird (*Tyrannus tyrannus*)		X
Horned lark (*Eremophila alpestris*)	X	X
Tree swallow (*Tachycineta bicolor*)	X	
Cliff swallow (*Hirundo pyrrhonota*)	X	
Barn swallow (*Hirundo rustica*)	X	
Clark's nutcracker (*Nucifraga columbiana*)	X	X
Black-billed magpie (*Pica pica*)	X	X
Common raven (*Corvus corax*)	X	X
Mountain chickadee (*Parus gambeli*)		X
Rock wren (*Salpinctes obsoletus*)	X	X

Appendix C (continued).

Species	Ft. Harrison	Limestone Hills
House wren (*Troglodytes aedon*)	X	
Mountain bluebird (*Sialia currucoides*)	X	X
American robin (*Turdus migratorius*)	X	X
European starling (*Sturnus vulgaris*)	X	X
Unidentified vireo (*Vireo* spp.)	X	
Yellow warbler (*Dendroica petechia*)	X	X
Green-tailed towhee (*Pipilo chlorurus*)		X
Spotted towhee (*Pipilo maculatus*)	X	X
Chipping sparrow (*Spizella passerina*)	X	
Brewer's sparrow (*Spizella breweri*)	X	X
Vesper sparrow (*Pooecetes gramineus*)	X	X
Lark sparrow (*Chondestes grammacus*)	X	X
Dark-eyed junco (*Junco hyemalis*)		X
Western meadowlark (*Sturnella neglecta*)	X	X
Brown-headed cowbird (*Molothrus ater*)	X	
Pine siskin (*Carduelis pinus*)		X
House sparrow (*Passer domesticus*)	X	X
MAMMALS		
Big brown bat (*Eptesicus fuscus*)	X	
Unidentified bat (*Myotis* spp.)	X	X
Mountain cottontail (*Sylvilagus nuttallii*)	X	X
White-tailed jackrabbit (*Lepus townsendii*)	X	X

Appendix C (continued).

Species	Ft. Harrison	Limestone Hills
Yellow-pine chipmunk (*Eutamias amoenus*)	X	X
Yellow-bellied marmot (*Marmota flaviventris*)	X	X
Black-tailed prairie dog (*Cynomys ludovicianus*)	X	
Columbian ground squirrel (*Spermophilus columbianus*)	X	
Richardson's ground squirrel (*Spermophilus richardsonii)*		X
Beaver (*Castor canadensis*)	X	
Deer mouse (*Peromyscus maniculatus*)	X	X
Bushy-tailed woodrat (*Neotoma cinerea*)		X
Porcupine (*Erethizon dorsatum*)	X	
Coyote (*Canis latrans*)	X	X
Raccoon (*Procyon lotor)*	X	
Striped skunk (*Mephitis mephitis*)	X	X
Elk (*Cervus elaphus*)	X	X
Mule deer (*Odocoileus hemionus*)	X	X
White-tailed deer (*Odocoileus virginianus*)	X	
Pronghorn (*Antilocapra americana*)		X
REPTILES		
Gopher snake (*Pituophis catenifer*)		X
Western rattlesnake (*Crotalus viridis*)		X
Western terrestrial garter snake (*Thamnophis elegans*)		X
AMPHIBIANS		
None		

Appendix D

List of Archeological Sites in the Limestone Hills Study Area

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation.

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex/Phase	Source
24BW626	Lithic debris/ artifacts Faunal remains Charcoal/ f.b.r./hearths	Open air occupation	Undetermined	Open air Subsurficial	Prehistoric	Middle Prehistoric	Mummy Cave	1979 MSU Survey
24BW627	Rock piles	Rock piles	100	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW628	Rock piles	Rock piles	5	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW629	Stone alignments	Game drive	Not applicable	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW630	Stone circles Lithic artifacts	Habitation/ Stone circles	20,235	Open air/ Subsurficial	Prehistoric	Late Prehistoric, Middle Prehistoric	Old Women's, Pelican Lake	1979 MSU Survey
24BW631	Lithic debris/ artifacts Historic ruins	Open air occupation/ Habitation/ Foundation/ Mining pit	80,938	Open air/ Surficial	Prehistoric/ Historic	Historic White, Historic Amerindian, Late Prehistoric, Middle Prehistoric	White, Indian, Old Women's, Pelican Lake	1979 MSU Survey
24BW632	Historic ruins Lithic debris/ Artifacts	Open air occupation/ Habitation/ Cabin	20,235	Open air/ Subsurficial	Prehistoric/ Historic	Historic, Middle Prehistoric	White, Pelican Lake	1979 MSU Survey, Helmick Collection
24BW633	Stone alignment	Game drive	Not applicable	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex/Phase	Source
24BW634	Historic ruins	Habitation/ Foundation	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW635	Lithic debris Fire-broken rock	Open air occupation	80,100	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW636	Lithic debris/ artifacts	Quarry	15,000	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW637	Stone Circle Lithic debris/ [illegible]	Habitation/ Stone circle	2,020	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW638	Historic ruins	Habitation/ Foundation	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW639	Rock piles	Rock piles	20,235	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW640	Lithic debris/ artifacts Historic ruins	Open air occupation/ Habitation/ Foundation	20,235	Open air/ Surficial	Prehistoric/ Historic	Historic, Middle Prehistoric	Recent, Pelican Lake	1979 MSU Survey
24BW641	Lithic debris/ artifacts	Open air occupation	2,500	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW642	Lithic artifacts Rock piles	Open air occupation/ Rock piles	900	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW643	Historic ruins	Habitation/ Foundation	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex/Phase	Source
24BW644	Lithic artifacts	Open air occupation	8,094	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW645	Lithic artifacts	Open air occupation	4,040	Open air/ Surficial	Prehistoric	Late Prehistoric	Old Women's	1979 MSU Survey
24BW646	Rock pile	Rock pile	1	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW647	Lithic debris/ artifacts	Open air occupation	2,000	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW648	Lithic debris/ artifacts	Open air occupation	20,235	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW649	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Subsurficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW650	Lithic artifacts	Open air occupation	8,094	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW651	Lithic debris	Open air occupation	4,097	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW652	Lithic debris/ artifacts	Open air occupation	7,000	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW653	Lithic debris/ artifacts Fire-broken rock	Open air occupation	2,020	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW654	Historic ruins	Habitation/ Foundation	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW655	Historic ruins	Habitation/ Foundation	8,095	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex/Phase	Source
24BW656	Lithic artifacts Fire-broken rocks Faunal remains	Habitation/ Rockshelter	9	Rockshelter	Prehistoric	Late Prehistoric	Old Women's	1979 MSU Survey
24BW657	Rock pile	Rock pile	3	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW658	Lithic artifacts	Open air occupation	2,040	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW659	Historic ruins Lithic debris/ artifacts	Open air occupation/ Habitation/ Foundation	8,094	Open air/ Surficial	Prehistoric/ Historic	Historic, Indeterminate	White, Indeterminate	1979 MSU Survey
24BW660	Lithic debris/ artifacts	Open air occupation	8,094	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW661	Stone circles Historic ruins	Habitation/ Stone circle/ Foundation	40,469	Open air/ Subsurficial	Prehistoric/ Historic	Historic, Indeterminate	White, Indeterminate	1979 MSU Survey
24BW662	Stone circle	Habitation/ Stone circle	10	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW663	Lithic debris/ artifacts	Open air occupation	2,023	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW664	Ovoid rock feature	Anomalous rock structure	4,097	Open air/ Surficial	Unknown	Indeterminate	Indeterminate	1979 MSU Survey
24BW665	Rock pile	Rock pile	1	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex/Phase	Source
24BW666	Lithic debris/ artifacts Fire-broken rock	Open air occupation	101,173	Open air/ Surficial	Prehistoric	Early Prehistoric, Middle Prehistoric	Indeterminate, Pelican Lake	1979 MSU Survey
24BW667	Lithic debris/ artifacts	Open air occupation	4,097	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW668	Lithic debris/ artifacts	Open air occupation	100	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW669	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW670	Lithic debris/ artifacts	Quarry	61,704	Open air/ Subsurficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW671	Lithic debris	Open air occupation	2,023	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW672	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Subsurficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW673	Historic ruins	Habitation/ Foundation	900	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW674	Lithic debris/ artifacts	Open air occupation	2,020	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW675	Stone circles Lithic debris/ artifacts Faunal remains Hearth/F.B.R.	Habitation/ Stone circle	60,704	Open air/ Subsurficial	Prehistoric	Late Prehistoric	Besant	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex-Phase	Source
24BW676	Lithic debris/ artifacts	Open air occupation	8,094	Open air/ Subsurficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW677	Lithic debris/ artifacts	Open air occupation	12,130	Open air/ Subsurficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW678	Lithic debris/ artifacts	Open air occupation	121,307	Open air/ Subsurficial	Prehistoric	Middle Prehistoric	Oxbow, Pelican Lake	1979 MSU Survey
24BW679	Lithic artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW680	Historic ruins	Habitation/ Cabin	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW681	Historic ruins	Habitation/ Cabin	4,047	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey
24BW682	Lithic debris/ artifacts	Open air occupation	20,235	Open air/ Surficial	Prehistoric	Late Prehistoric	Old Women's	1979 MSU Survey
24BW683	Lithic debris/ artifacts	Open air occupation	12,131	Open air/ Surficial	Prehistoric	Late Prehistoric	Old Women's	1979 MSU Survey
24BW684	Lithic debris/ artifacts	Open air occupation	20,235	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW685	Stone circles	Habitation/ Stone circle	600	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW686	Historic ruins	Habitation/ Cabin	1,000	Open air/ Surficial	Historic	Historic	White	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex-Phase	Source
24BW687	Lithic artifacts Faunal remains	Habitation/ Rockshelter	10	Rockshelter	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW688	Historic painted signs	Historic pictographs	20	Pictographs	Historic	Historic	White	1979 MSU Survey
24BW700	Lithic debris/ artifacts	Open air occupation	8,094	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW701	Lithic debris/ artifacts	Open air occupation	2,020	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW702	Lithic debris/ artifacts	Habitation/ Stone circles	40,469	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW703	Lithic debris/ artifacts	Open air occupation	16,188	Open air/ Surficial	Prehistoric	Late Prehistoric, Middle Prehistoric	Old Women's, Besant, Pelican Lake	1979 MSU Survey
24BW704	Stone circles Lithic debris/ artifacts	Habitation/ Stone circles	40,469	Open air/ Surficial	Prehistoric	Late Prehistoric	Old Women's	1979 MSU Survey
24BW705	Stone circle Lithic artifacts	Habitation/ Stone circle	2,020	Open air/ Subsurficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW706	Stone circles Lithic debris/ artifacts	Habitation/ Stone circles	40,469	Open air/ Subsurficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW707	Stone circle	Habitation/ Stone circle	2,020	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey

Table 4. Limestone Hills Archaeological and Historical Sites: Site Characteristics and Chronological-Cultural Affiliation (continued).

Site Number	Physical Indicators	Type of Site	Site Size (m^2)	Context	Interval (P/H)	Cultural Period	Cultural Complex-Phase	Source
24BW708	Rock pile Lithic debris/ artifacts	Open air occupation/ Rock pile	8,094	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW709	Rock pile	Rock pile	2	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW710	Lithic debris/ artifacts	Open air occupation	8,094	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW711	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW712	Lithic debris/ artifacts	Open air occupation	20,235	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW713	Lithic debris/ artifacts Fire-broken rock	Open air occupation	40,469	Open air/ Surficial	Prehistoric	Late Prehistoric	Besant	1979 MSU Survey
24BW714	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW715	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW716	Lithic debris/ artifacts	Open air occupation	101,173	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey
24BW717	Lithic debris	Open air occupation	400	Open air/ Surficial	Prehistoric	Indeterminate	Indeterminate	1979 MSU Survey
24BW718	Lithic debris/ artifacts	Open air occupation	4,047	Open air/ Surficial	Prehistoric	Middle Prehistoric	Pelican Lake	1979 MSU Survey